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International Science and Technology Institute, Inc.

A MEDIUM TERM PLAN FOR THE AGRARIAN RESEARCH AND TRAINING INSTITUTE INFORMATION CENTER

Prepared for:

U.S. Agency for International Development
Colombo, Sri Lanka
(Contract No. PDC-0000-31-3083-00)

August 1985

2033 M Street, N.W. ▪ Washington, D.C. 20036 ▪▪▪ (202) 466-7290 ▪ Telex 275-445 TSI UR

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By:

Steven R. Tabor, Consultant

International Science & Technology Institute, Inc.
2033 M Street, N.W., Suite 300
Washington, D.C. 20036

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PART I: SUMMARY & RECOMMENDATIONS

I. Scope of the Plan

This is the first of a two parts Medium-Term Plan for the ARTI Information Center. Part one provides an overview of the main findings from the Plan and a consolidated set of Plan targets and implementation activities. Part two presents the detailed Plan.

The Plan covers the primary activities of two of the newer units within the Information Center. These are the Computer Center and the Data Development Unit. Since the National Agrarian Data Bank is maintained by both units, it is also discussed in the context of the Plan. The Plan period begins in mid-1985 and extends through the end of 1989.

The Plan was prepared by Steven R. Tabor, a consultant with the International Science and Technology Institute Inc. during the months of May, June and July of 1985. The staff of the Information Center were closely involved in the preparation of the Plan.

II. The Strategic Orientation

The Plan envisions a strategic shift in emphasis for the Information Center from serving a braodly defined group of users within and outside of the Agrarian Research and Training Institute to focusing the Center's services primarily on the ARTI research staff. The primary aim of the Plan is to promote a set of activities which will lead to closer cooperation and integration of the Information Center with the balance of the ARTI. This prioritization of Center resources is a reflection of the rightfull recognition by ARTI's management that the Information Center must be developed to a point at which it can supply a high-quality service to the Institute staff before it can attempt to serve a broader national-base of users.

Second, the National Agricultural Data Bank should be developed to meet the demands of users. In other words, only such data for which there is a demonstrable demand should be in the Bank. And only that data which has a high probability of usage should be computerized.

A third major Plan strategy is that the Information Center should adopt an indirect coordinating role in agrarian statistical affairs. Rather than base it's coodinating role on the direct collection and provision of data to planners and policy-makers--which is unlikely to work because of the very low demand by these groups for ARTI Data Bank services--the Center should adopt a more indirect coodinating role by preparing indexes of agricultural statistics; conducting statistical workshops and commenting on statistical collection and reporting systems through a regular bulletin or newsletter.

III. Main Findings

The main findings from each chapter of the Plan are summarized in this section. More detailed background information and activity descriptions can be found in Part II.

1. Objectives: The initial objectives of the computer center need to be revised in light of the lessons learned during the first few years of activity. The Center should gear it's services to meet the needs of the ARTI research staff, rather than try to develop as a national service organization geared towards aiding a broadly defined group of planners, policy-makers and researchers. Center management should practice careful cost-control and sound financial management but should not expect to either cover costs or make a profit on the Information Center. The Center should try to indirectly coordinate the flow of agricultural data through providing information about data sources, data-gaps and means of improving collection and data base techniques, instead of directly providing agricultural data to all those with a particular data-demand. The Center should operate the National Agrarian Data Bank on the principle that what is stored in the Bank is what is requested. The operational recommendations in the Plan follow directly from this revised set of Center objectives.

2. Software and Hardware: Greater reliance should be placed on the use of packaged Wang Utilities and micro-computer software for analyzing survey data. Custom designed software should only be developed as a last resort measure for jobs which cannot be efficiently executed otherwise. A high priority should be accorded to developing software for the National Agrarian Data Bank and the Market Research Unit's weekly prices survey. Software availability should be improved by adding graphics, advanced statistics, word processing and integrated-packages capabilities to the micro-computer that is to be networked to the Wang mini-computer. Future hardware expansion should be in the direction of building a network of micro-computers rather than upgrading to a larger or more powerful mini-computer. Safe off-line storage facilities should be provided and the service agreement for the computer center should be re-negotiated.

3. The National Agrarian Data Bank: There are over 2,600 series of agricultural statistics in the Data Bank collection, of which only twelve percent have ever been requested by Data Bank users. The computerization of the Data Bank should be built around that data which has been requested. Changes in the composition of the Bank should be based on documented usage, ARTI demand, topicality and strong non-ARTI demand. The procedures for using the Data Archives field survey data should be streamlined and a promotion campaign mounted for this data. The Center should strive to indirectly coordinate the flow of agricultural data by publishing an index of agricultural statistics, holding data workshops and regularly publishing articles of interest on statistical affairs.

4. Manpower and Training: Labour demand should be matched to supply. In the near-term, this will require recruitment of a Data Bank manager and the phasing-out of the six casual investigators employed by the Data Development Unit. Plans should be made to recruit and train a replacement for the Deputy Director and, if possible, a suitable candidate should be identified within the Institute. Staff skills should be upgraded particularly in the use of micro-computer based software packages. The Data Processing Manager and the Data Bank Manager should both be provided training in the fundementals of business management. The qualification levels of the Systems Analysts/ Programmers and the Data Analysts should be upgraded through external degree training. ARTI staff should be offered annual training courses in word processing, survey processing and statistical applications. Selected members of the staff should attend the series of micro-computer application courses offered by DMS-Wang.

5. Publicity and Outreach: Relatively little publicity and outreach for the Information Center has been done both within and outside of ARTI. This a major reason for the low number of facility users. Promotion responsibilities should be assigned to each member of the Information Center staff. Also, special use should be made of the professional publicity services offered by the ARTI Publications Unit. The prime responsibility of the Data Bank Manager should be to market the Bank's services. Brochures should be developed and distributed for each of the service-lines within the Center. A comprehensive catalog of available indicators should be on-hand; training seminars should be held frequently and promotional material dissemenated through newsletters, newspaper articles and direct solicitation. An annual survey of Information Center users should be held to identify ways and means of improving service delivery.

6. Cost-Control and Revenue Generation: The operating costs of the Information Center are approximately Rs.86,000 per month. Total revenue collected is on the order of Rs.2,000 per month, or less than three percent of total operating costs. Better cost accounting and cost-awareness must accompany measures to contain expenditures. Costs can be contained by identifying grant financing for computer hardware/software replacement and expansion, re-negotiating the service agreement, reducing the number of casual investigators and canceling the annual Minitab rental. Clear guidelines on job-costing and adoption of a streamlined set of procedures will ensure that fully-financed customers do make use of the computer Center. By containing costs and improving revenue generation efforts, the Center can expect to recover approximately 10 percent of it's operating expenditures. The balance should be funded through the Government Budget for the Institute.

7. Management Improvement: There is a broad lack of a system's orientation in the Information Center. Scant attention is

provided to planning and designing procedures for computerization. Most jobs are implemented in an ad-hoc fashion and require almost immediate repair and redesign. This tendency to rush to implementation without adequate advance planning is reinforced by certain management procedures and practices. In the future, much higher priority should be accorded to job-planning and job-design. Project and system documentation should be regularly reviewed and contingency planning should be used to improve system security. Labor productivity is one-third to a half of that in private installations. It is inappropriate to offer special financial incentives to raise productivity, but this option should be considered if the demand for using the Center rises. Higher productivity rates should be obtained by linking provision of training opportunities to better job performance. The provision of a proper work environment is essential if job performance is to be improved. In the near-term, more work-space must be provided for the Center staff.

8. Ongoing Planning: The Medium-Term Plan must be complemented by a set of short and longer-term planning activities. These activities can be conducted by the Center staff but should also include an outside, independent review. Short-term planning should be used to solve problems, meet particular project dealines and track target-achievement progress. Longer-term plans should be used to guide manpower and training programs, outreach campaigns, hardware and software procurement and to assess the degree to which the goals and objectives of the Center need to be revised.

IV. A Consolidated Set of Development Targets and an Implementation Timeframe

A set of the primary targets for the medium-term planning period is as follows:

A. Hardware and Software

1. The provision of custom-designed software for automating the Development Indicators data bank and for computerizing the Market Research Unit's weekly prices survey by the end of calender 1985.
2. Provision of packaged software on the micro-computer for word-processing, statistics, graphics, integrated applications and data-base management by the end of calender 1986.
3. Provision of a safe off-line storage system by end 1986.
4. A hardware configuration that meets user demand based on an assessment of the latter in calender 1986 and calender 1988.
5. A policy on replacement of the computer system drafted by the end of calender 1988.

B. The Data Bank

1. Computerization of the agriculture data bank, starting with the 12 percent of the data previously requested and based on an off-line storage and retrieval system.
2. Preparation of a development indicators catalog.
3. Preparation of an agricultural statistics index.
4. Annual user/supplier workshop.
5. Publication of user awareness articles about agricultural data.
6. Institution of a formal review process for adding and deleting indicators from the data bank which is based on use, topicality, ARTI request and outside demand.

C. Manpower and Training

1. Identification and recruitment of a Data Bank Manager by 1986.
2. User training sessions held for ARTI staff by DMS-Wang and by the computer center staff.
3. Training sessions held for Information Center staff according to the training plan.

D. Promotion and Outreach

1. Ninety percent of the research staff regularly using the Data Bank by 1989.
2. Fifty percent of the research staff engaged in hands-on use of ARTI computer facilities by 1989.
3. A twenty percent rate of growth in the number of non-ARTI staff accessing the data bank by end 1986. Thereafter a ten percent rate of growth in non-ARTI Data Bank clients each year.
4. A minimum of two requests serviced for data from the data archives section of the Data Bank per year begining in 1987.
5. A minimum of two outside survey analysis, or word processing, or graphics or statistical analysis jobs processed at the Information Center each year.

E. Cost Control and Revenue Generation

1. Reduction of operating costs by 30 percent in real 1985 terms, through use-of selected cost containment measures.
2. An increase in staff productivity by ten percent per annum as measured in (a)surveys processed in the computer center, (b)average WP pages/hour, (c)Pages of Data Provided/Cost of the Data Devt Unit, and (d)Number of Customers/Cost of the Data Devt Unit.

F. Management

1. Development of a general terms of reference for senior staff by end-1986.
2. Complete systems dossier available for the development indicators and the market research unit computerization.
3. All logbooks completed and accurate (annual target).
4. Supplies inventory kept up-to-date and no shortage of consumables experienced (annunal target).
5. Improved work facilities provided (end 1987 target).

A set of routine and non-routine activities must be implemented in order to achieve the above listed development targets. A consolidated list of development activities, and a time frame for implementation follows:

Activity	Year				
	1985	1986	1987	1988	1989
A. Hardware and Software					
1. custom software development					
(a) Data Bank	X	X	X	X	X
(b) MRU survey	X	X			
2. Wang-PC software procurement					
(a) integrated package	X				
(b) word-processing		X			
(c) advanced stats		X			
(d) data base management		X			
(e) linear programming		X			
3. Off-line storage review		X			
4. User-demand and hardware options review		X			X
5. System-replacement review				X	
B. The Data Bank					
1. Data Bank Computerization					
(a) design completion	X				
(b) testing and handover	X	X			
(c) general indicators system design		X			
(d) testing and handover		X			
2. Coordination					
(a) agr. data index prepared		X			
(b) agr. index published		X			X

Activity	1985	1986	1987	1988	1989
(c)awareness notes published		X	X	X	X
(d)user/supplier/data base builder seminars		X	X	X	X
3. Collection Strategy					
(a)adoption of user-based collection principles		X			
(b)implementation of new guidelines for adding material to the Base		X	X	X	X
(c)preparation of a collection time-schedule		X			
4. User Aides					
(a)preparation of a catalog of data in the computer	X	X			
(b)preparation of a register of meta-data		X			
5. Survey Archives					
(a)preparation of a set of procedures for accessing the survey archives		X			
C. <u>Manpower and Training</u>					
1. Recruitment of a Data Bank Manager	X	X			
2. Data Bank Staffing Review	X	X			
3. Contingency Planning for Computer Staff Replacement	X	X	X	X	X
4. Recruitment for Deputy Director Replacement		X	X		
5. Information Center Training on Micro's (5 officers)	X	X			
6. Business Training for DPM and DBM		X	X		
7. External Degree Training for Programmers and Data Analysts		X	X	X	X
8. Regional Visits and Training			X		X
9. ARTI staff training in WP, survey processing and stats applications					
(a)Class Materials devd.	X	X			
(b)Classes conducted		X	X	X	X
10. DMS/Wang Micro-computer training for research officers (5)	X	X			

Activity	1985	1986	1987	1988	1989
D. Publicity and Outreach					
1. Mailing/Phone List					
(a) draft developed	X				
(b) updated		X	X	X	X
2. Service Brochures					
(A) Data Bank	X				
(B) WP Services		X			
(C) Stat Services		X			
(D) Survey Analysis		X			
(E) New Service Lines			X	X	X
3. Data Bank Catalog					
(A) Draft Prepared	X				
(B) Updates Released		X	X	X	
4. ARTI Staff Seminars					
(A) Word Processing	X	X	X	X	X
(B) Survey Processing		X	X	X	X
(C) Statistical Analysis		X	X	X	X
(D) Other new applications			X	X	X
5. Research Community Seminars		X	X	X	X
6. Data Bank Publicity					
(A) brochure distributed	X				
(B) info-note in MRU newsletter		X	X	X	
7. User Participation Survey		X	X	X	X
E. Cost Control and Revenue Generation					
1. Cost Summary-cum-Accounting	X	X	X	X	X
2. Cost-Containment Measures					
(a) labor retrenchment	X	X			
(b) cancel minitab rental	X				
(c) redo maint. agreement	X	X			
(d) find replacement financing		X	X	X	
3. Revenue Generation					
(a) annual review	X	X	X	X	X
(b) charge-comparisons with private firms	X	X	X	X	X
F. Center Management					
1. Staff TOR's Prepared		X			
2. System Dossiers					
a. Data Bank job	X				
b. Market Research job	X				

Activity	1985	1986	1987	1988	1989
3.Documentation					
a. logbooks prepared and updated	X	X	X	X	X
b. program documentation prepared and reviewed		X	X	X	X
c. Data Bank catalog prepared and updated	X	X	X	X	X
4.System Security					
a. seperate backup storage space identified		X			
b. data bank files stored in locked cabinet	X				
5.Assessment of the Need for a staff incentives scheme			X		
6.Identification of Additional Work Space		X			

G.<u>Ongoing Planning</u>

1.Long-term Planning					
(A)Strategy Reformulation			X	X	X
(B)Long-Term Evaluation/ Perspective Plan					X
2. Short-term Planning					
(A)Equipment Plan		X	X	X	
(B)Training/Manpower Plan	X	X	X	X	

PART II: MAIN REPORT

Chapter 1: An Introduction to the Medium-Term Plan

A. The Scope of the Plan

A Medium-Term Plan for the ARTI Information Center has been prepared in order to frame a development path and strategy for the mid-1985 to end-1989 period. The Plan was drafted by Steven R. Tabor, a consultant to the Information Center, during June and July of 1985. The Plan was prepared in close consultation with ARTI staff and was based on a review of the Center's progress and interviews with representatives of Government Ministries, Banks, Universities, Research Institutes, Donor Agencies, Computer Vendors and Training Centers. A list of the Institutions which provided information for the Plan is included as annexure 1.

The Information Center includes the Data Development Unit, the Computer Center and the Library. Except for a brief discussion of computerization options, the Library is not covered in this Plan. The reasons for this are that the Library is a well established service within the Institute; has a clearly defined development approach and functions semi-autonomously from the balance of the Information Center. The Computer Center and the Data Development Unit are relatively new bodies which have evolved in a decidedly experiemental fashion over the past three years.

The Medium-Term Plan is prepared in two parts. Part one presents a consolidated summary of the major findings and recommendations. Part two presents the detailed Plan and is divided into ten chapters. Chapter one reviews the background of the Center and the scope of the Medium-Term Plan; chapter 2 discusses the goals and objectives of the Center; chapter 3 presents the options for improving hardware and software; chapter 4 presents a strategy for developing the National Agricultural Data Bank; chapter 5 reviews manpower and training needs; chapter 6 is c promotion and outreach efforts; chapter 7 is devoted to cost-control and revenue generation measures; chapter 8 is on management improvement strategies and chapter 9 discusses ongoing planning requirements.

B. The Background to the Information Center

The Information Center is an outgrowth of the Statistics Unit's agrarian data card-file service and the Library. The Information Center was formally institutionalized with support from the USAID in September of 1979. The Center consisted of four parts: the library, the computer center, the data development unit and the publications unit. In 1983/84 the Pulications Unit became a seperate body within the ARTI, leaving the other three groups to comprise the Information Center.

One of the prime motivations behind the formation of the Information Center was to provide a National Centre for Information on Agrarian Development, built around an Agrarian Data Bank. To achieve this end, an Agricultural Data Bank was designed to include a set of development indicators and an archives of primary survey data. With the provision of a mini-computer in February 1984, work was initiated on the automation of the Data Bank.

C. Accomplishments of the Center

There are several notable accomplishments of the Data Development Unit and the Computer Center. The Data Development Unit has designed a Development Indicators Data Bank and has collected and coded 2,613 discrete indicator series of secondary statistics about agriculture and general development. This is the equivalent of 6.6 MB of non-coded numerical data. As of July 1985, twenty-seven percent of this data had been coded and entered into the computer. The Data Bank has supplied development indicators data to an average of 30 users within ARTI and 56 users outside of ARTI each year. The Unit has assembled information on collection techniques for relevent indicators and has partially computerized this information. The Data Development Unit has established contacts with 42 suppliers of secondary data and has arranged for those suppliers to deposit data with the Institute. The Data Development Unit has established procedures for the use of survey data stored in the Archives part of the Data Bank. The Unit has also organized the manually tabulated surveys in a form that allows for their eventual integration into the Data Archives.

The computer center has provided services to clients within and outside of ARTI. Since February of 1984, the Center has processed nine field surveys, including four for outside customers. The computer center staff has prepared a demonstration programme for the Data Bank and has organized the data entry and verification for the development indicators data from the Data Bank. Approximately forty documents have been prepared using the word processing facilities and a small number of users have made extensive use of the Minitab statistics program. The computer center staff, in conjunction with DMS/Wang, held a training and orientation day for the ARTI research staff. The computer center staff have assisted three foreign consultants with computer training classes for the Institute. The computer terminals have operated, for one-shift, at close to eighty percent of full capacity. At present, approximately 340 hours of terminal time is used per month and approximately 11 hours of CPU time. An average breakdown (for May/June 1985) of terminal time allocation is 26 percent for Data Bank applications, 33 percent for survey analysis, 21 percent for word processing, 10 percent for statistical applications and 10 percent for system maintenance and other applications.

D. Constraints to be Overcome

The Information Center has made considerable progress during the last four years despite a number of formidable constraints. The Center was faced with a delay of almost four years in the procurement of a computer. The Center was started by a staff that had relatively limited training and experience in statistics, data collection methods and most importantly, computer science. For the first 14 months, the computer center was operated by junior staff without a data-processing manager. The Information Center staff was given the responsibility for designing and implementing a national agriculture data bank and to establish a mini-computer based computer center, although none of the staff members had experience in these fields.

The Center still functions under certain constraints. Staff skills and experience, particularly in systems design and micro-computer applications, require upgrading. The Information Center suffers from several 'shortages'. For the Data Development Unit, there is a clear shortage of customers or users and a shortage of software for automating their data-bank job. For the Computer Center, there is a clear shortage in hard-disk storage space, back-up facilities and most importantly, in user-friendly software. These 'shortages' act as constraints to the Center's future progress and are addressed within the Plan. The Information Center has labored for several years with vague objectives and an excessively broad set of priority users. This has been the most difficult constraint to the Center's progress. None of these constraints are fatal to the operation of the Center, but if traditional practices persist, many of these constaints will continue to obstruct progress.

E. The Strategic Focus of the Medium-Term Plan

The Medium-Term Plan envisions a shift in emphasis within the Information Center from that of a broad-based service facility to a more closely integrated unit within ARTI. This shift in emphasis is based on the premise that the Information Center will be in a better position to serve the needs of planners, policy-makers and others concerned with agriculture outside of ARTI after it firmly establishes itself as a vital service organization within the Institute. This is based on the belief that it will be more productive for the Information Center to focus it's attention on one particular client group--eg. the ARTI researchers--than to try to serve many different types of clients at one time. The Information Center can serve as a national resource, through the provision of the Data Bank and other facilities, but it will require an ample breaking-in period before such services can be properly developed and marketed. During this learning-period, every effort should be made to ensure that the needs of the ARTI research staff are accorded the highest priority.

A second shift in emphasis is from what could be considered a supply-push orientation to a demand-pull orientation. Instead of supplying services to users and then trying to determine if those are useful services to supply or not, the Information Center must make more of an effort to determine what is useful and then target their efforts to supplying such services. This implies that the Information Center must do considerably more reconnaissance work, or market-investigation work, before supplying an information service. This will have important implications for the way in which services are offered to the ARTI staff and, in particular, to the way in which the Data-Bank is designed and automated.

Chapter II. Defining the Objectives of the Information Center

A. The Need for Clear Goals and Objectives

A clearly prioritized set of goals and objectives is required in order to frame a development strategy and to construct a realistic plan. The objectives of the Information Center should be clearly defined yet flexible enough to allow for changes in resource availability and institutional needs that may arise during the planning period. If the objectives of the Information Center are only broadly specified, or not specified at all, then the Center staff will likely operate on the basis of tradition and instinct. This will result in a pattern of work in which activities are executed mechanically, without sufficient understanding or guidance and in an inevitably inefficient and inadequate fashion.

The goals and objectives of the Center should serve to direct a supply of information services to a set of established users, ranked according to need. In framing these objectives, the decision-makers must take into account the resources presently available at the Center and those that are likely to become available within a medium-term planning horizen. The framing of the Information Center's objectives should also take into account the differing needs of client groups for the Center's services.

The greater the participation of the Information Center staff in framing the goals and objectives, the greater the likelyhood that the goals and objectives will be translated into positive actions. At the very least, the staff must be made aware that certain goals and objectives have been set and that the targets and work activities are designed to achieve these particular goals and objectives.

The progress and achievements of the Information Center can best be measured according to the extent to which reasonable goals and objectives have been met. If the Center functions without clear, or realistic, goals and objectives, then it will be difficult to track and monitor the Center's progress, much less to evaluate the progress or impact of the information services provided.

B. Current Goals and Objectives

The current goals and objectives of the Information Center are broad and ambitious. The goals and objectives of the Information Center have been documented in a variety of project reports and Institute brochures. The broad objectives of the Center can be gleaned from these documents.

According to the 'Information Bulletin' (June 1984), the primary objective of the Center is to "facilitate access to information of relevance in agrarian development to Researchers, Planners and Policy Makers". For the data bank, the guiding principles were:

"1. To facilitate ready and equal access to the existing (sic. Agrarian) quantitative data, such data should be centrally located, and the services should be automated.
2. Such a Centre, serving as a coordinating agency for quantitative data would be in the best position to best identify gaps in information and new data needs and activate generation of new series of data.
3. Data collected through special surveys and studies can be used for purposes in addition to those for which they were collected and thus, be valuable resources to social scientists both in the present and the future and that the value of the data becomes enhanced when information regarding the characteristics of the data are also available.(1)"

Project documents cite other aims and objectives. These include (a) the desire to establish a Center in such a fashion so that it can recover it's costs and (b) the desire to use the computer center to handle and promote more advanced quantitative analysis by the ARTI staff.

The objectives of the ARTI Information Center are summarized as follows:

(1)to provide information services to researchers, planners and policy-makers.
(2)to provide a centrally located agricultural data bank, with ample documentation on data collection characteristics.
(3)to serve as a clearinghouse of agricultural information and to coordinate the flow of agricultural data.
(4)to provide research support services to ARTI researchers, particularly to support statistical analysis.
(5)to develop the Center in such a fashion so that costs are covered.

Many of these goals and objectives were set before the computer was installed and before the ARTI Data Bank was broadened to become a national resource. In light of the lesson's learned in the early years of the Center's operation, plus the signs of rapid advancement in agricultural-computerization throughout the government sector, there is ample reason to adjust, or revise, these guiding goals and objectives.

C. Prioritization of Client Groups

Policy-makers and planners have made realtively little use of the data bank or of the computer center facilities available at ARTI. In fact, Government Ministries and Statuatory Organisations have accounted for only six percent of the direct requests for data from the data bank, as is reported in table 2.1 below:

Table 2.1: Number of Data Bank Requests by Category of Users

	(Year)				
	1982	1983	1984	Total	Percentage (%)
ARTI	36	110	121	267	76
Ministries and Statutory Org.	5	8	9	22	6
Other	15	19	31	65	18
Total	56	137	161	354	100

*1982 figures pertain to the number of requests made as of 1 March, 1982. The request figures above measure the total number of requests for data bank services, not the total number of persons requesting data. For a more detailed breakdown, refer to chapter 4.

Government planners and policy-makers have also made use of the Information Center to process surveys and to conduct statistical analysis. A listing of the jobs requested by Government agencies is as follows:

1. Post-Harvest Losses of Fresh Fruit, 1985
   (statistical analysis--CISER)
2. Agricultural Manpower Study, 1985
   (survey analysis and word processing--UGC)
3. Mahawelli Community Radio, 1985
   (survey analysis, SLBC)

Several factors explain the reluctance of the planners and policy-makers to make direct use of the Information Center. Many planners and policy-makers stated that they were simply too busy to consider regularly using the Information Center facilities. They felt that it would be preferable for the ARTI data bank staff to bring data to the planners, than for the planners to go collect the information from the Center.

Planners and policy-makers must be in a position to obtain secondary data well before that data is approved for publication and dissemination. Planners and policy-makers

require up-to-date data and information supplied on short notice. It is unlikely that the Information Center can develop such a quick-response automated Data Bank because of the delays that are involved in approving and clearing governmental data for official circulation.

Several Ministries maintain and prepare a statistical report which is used as a general reference for agricultural planning. For example, the Ministry of Agriculture publishes an annual Agriculture Statistics Bulletin; the Central Bank publishes an annual Agricultural Statistics Bulletin and the Central Bank Report; and the Bureau of Census and Statistics publishes a Statistical Yearbook. Although none of these provides a comprehensive treatment of the agricultural sector, many of the planners interviewed rely on these documents for their sector-wide data needs.

Several Ministries also maintain their own data banks. These statistics are used for designing and evaluating projects and programmes. Also, certain Ministries issue annual statistical reports based on the data that they have assembled. For example, the Ministry of Rural Industrial Development issues an annual Livestock Planning Statistics; the Ministry of Coconut Industries issues an annual Coconut Statistics; the Department of Agriculture issues an annual Cost of Cultivation report. These statistical collection and reporting services appear to satisfy the basic planning needs within these agricultural Ministries.

Computerization in the agricultural line Ministries is proceeding at a pace much faster than was anticipated at the start of this decade. This is primarily a result of the increased availability of low-cost, powerfull micro-computers with relatively user-friendly software. Almost all of the Agricultural Ministries either have micro-computers in operation or are planning to aquire them. New agriculture-sector projects which will involve computerization include:

1. An Agricultural Planning Project (USAID/GSL financed) is in design; this project will computerize six planning units in as many different agricultural Ministries. A priority use of computers in these Ministries is for data base management.
2. A proposal has been submitted to the ODA for the introduction and support of micro-computers in agricultural research institutes.
3. An evaluation study is being conducted on the computer requirements (including data base applications) of the Department of Agriculture.
4. The Rubber Research Insitute has procured micro-computers to serve in the development of a rubber data bank and to analyze rubber data.

5. The Agricultural University is negotiating with the Japanese Government for a major computer assistance project. One of the uses of the mainframe, mini- and micro-computers procured will be for development of specialized agricultural data banks.

The rapid developments (and dissemenation of those developments within Sri Lanka) in computer technology have created an information-environment in which economies of scale in data base development are drastically reduced. What this implies is that there is much less of a pressing need for a centralized Agricultural Data Bank in mid-1985 then there was when the Information Center project was formulated in 1979. There are still gaps in the data-network and ARTI can play a positive role in filling these gaps; however it appears that the rapid spread of computer facilities will offset the need for a strong centralized data facility.

In light of the fact that the participation of planners and policy-makers in the use of the Information Center has been quite modest and that computerization is spreading more rapidly than expected throughout the Agricultural Ministries, it would behoove ARTI to place a relatively low priority on directly supplying Information Services to Planners and Policy-Makers. A more reasonable course of action would be to gear the Information Center services to supply the needs of ARTI researchers and outside researchers who have a lower time-cost attached to their information retrieval demands.

This does not imply that planners and policy-makers will not benefit from the Data Bank and the other services supplied in the Information Center. Just the opposite is the case. Planners and Policy-Makers will certainly benefit if the quality of the research reports produced by the ARTI staff and the outside researchers is improved as a result of their usage of the data-bank and other Information Center services. In fact, the Information Center should aim to concentrate and improve it's attention to research support activities to increase the policy and planning multiplier effect resulting from improved research-products.

D. The Aim of Coordinating Data Flow

One of the aims of the Information Center is to coordinate the flow of data in the agricultural sector. This implies that the Information Center staff should be in a position to (1)identify areas where data supply is insufficient and suggest possible means of organizing collection of the relevant data; (2) identify users who would benefit from a greater reliance on agricultural data and provide such data to them and (3)evaluate the accuracy and integrity of exisiting data collection systems and make suggestions for improving such collection and dissemenation systems. This objective is valid,but it is likely beyond the capacity of the Center staff.

The existing ARTI Information Center staff is simply too small and lacks the skills required for such a responsibility. In addition, it is unlikely that the data-supplying agencies will be willing to cooperate if they envision the Information Center assuming more of an evaluatory or supervisory role. In the early stages of the Center's development, it is important that these linkages between the data suppliers and the Center are carefully nurtured.

The Center should strive to assume a more passive role in data coordination. Rather than try to coordinate the actual flow of data, the Center should provide information on data availability, the validity of different data sources and the need for data development. Instead of coordinating the flow of data, the Center should strive to coordinate the flow of 'thought' about agricultural data. In this latter sense, the Center would be performing more of a research or investigatory function. This would be more appropriate give the location of the Information Center in a research institute.

E. The Cost-Recovery Objective

The objective of developing the Information Center so that it covers it's operating costs is, for all practical purposes, unobtainable. While it is important to encourage budgetary-control and fiscal restraint, it is also equally important to recognize the revenue-generation limitations inherent in public enterprises. A fairly limited objective of increasing the level of cost control and budgetary restraint would be more appropriate.

If the Information Center were to attempt to recoup their costs through user-fees, the nature of the Center's activities would have to change drastically. This would mean that the Information Center would have to compete actively for outside word-processing and survey analysis jobs, and that other activities, such as ARTI survey processing and the automation of the Data Bank would be accorded a much lower priority. In other words, the Information Center would have to accept, and compete for, work much as any private installation does in order to cover costs. This is obviously unsatisfactory for a quasi-Governmental institution that has a mandate to conduct a specific form of research--namely that which is concerned with Agrarian affairs. Even if the Institute did decide to operate on a full cost-recovery footing, it is unlikely that it would be able to do so competitively. The productivity of the computer services offered at the Information Center is well below that of competing private sector data processing firms. For example, the data entry speed at the Information Center is approximately half that of local commercial firms and the word processing rate is approximatly one-third that of local firms.

The Information Center should not attempt to recoup the costs of it's operations when (a)the provision of services represents a legitimate public service, (b)the administrative cost of fee-collection outweigh the benefits gained and (c)when the benefits largely spillover to indirect users. In the case of the Data Bank, an argument can be made that this is a national resource and that the provision of data services is normally considered a public service for which no more than a nominal fee is levied. In addition, the administrative costs of collecting a non-trivial payment for Data Bank services will be high, since neither ARTI researchers or outside Government agents customarily budget for such aquisitions. In addition, a great deal of the benefits from the Data Bank spillover to those who use the findings from the research reports that employ this data. It would be impractical, or impossible, to collect fees from all those who do benefit from the use of such data.

The future financing policy of the Information Center should be to aim for the control-of-costs and the levying of user charges only in so far as this does not cause the Center to deviate from it's main form or work. For certain activities where there is a clearly established pattern of commercial activity, such as survey processing or word-processing jobs, the Center should apply a competitive charge system. However, the aim of this will not be to fully recover the Center's cost, or to turn specific activities into profit centers, but to discourage the use of the Information Center as a low-cost alternative to commercial processing.

F. Maintaining the Distinction Between Data and Information

Although the combination of the ARTI Computer Center, Data Development Unit and Library is termed the Information Center, this might rightly be called a Data Center. The terms data and information are often used interchangeably. This is incorrect and serves to distort the meaning and application of these terms. Riemenschneider and Bonnen provide a useful distinction between data and information:

> "A data system is fundementally an attempt to represent reality emperically... To become information, data requires analysis and interpretation to place them in a decision-making context. Raw data or even semi-processed data are rarely used directly by decision-makers. Instead, decision-makers require analysis to impart meaning to the data so they can be used to solve the problems of concern in the decision-making process... An information system is a process which imposes form and gives meaning to data (2)."

The ARTI Information Center has, and is likely to continue to have, the ability to supply users with relevant data. The Center does not have the ability to supply

limitations explain why the Center will remain primarily a provider of data services. This distinction is important because it serves to underscore the necessary symbiosis between the Information Center and the balance of the ARTI. In order for the data provided by the Information Center--in a raw, semi-processed or processed form-- to be used as information, a process of conceptualization and analysis must take place. For this, the ARTI researchers, who have developed a speciality and expertise in the various fields of agricultural inquiry, must participate and transform the data into information. This distinction between data-service provision and information-service provision is maintained in formulating the medium-term objectives of the Center.

G. Medium-Term Objectives for the Information Center

The Information Center should first and foremost serve the needs of ARTI researchers. Secondary attention should be devoted to serving the needs of outside researchers and others with a general interest in Agrarian affairs. Even lower priority should be attached to providing direct-access data-support services to planners and policy-makers.

Different users have different information service needs. A comparison of the primary needs of the different types of users is as follows:

1. ARTI Researchers: Survey Processing, Word Processing, Data Provision, Statistical Analysis Support.
2. Other Researchers: primarily Data Provision and occasional Statistical Analysis Support.
3. Other non-government users: Data Provision and occasional Survey Analysis Support.
4. Planners and Policy-Makers: Provision of Research Reports, Analysis of Secondary Data, occasional Survey Analysis and Data Provision.

The Information Center must concentrate it's resources on supplying the most important services to it's most important clients. That is a general statement of what the Center's objectives should be during the medium-term future. In more specific terms, the Center should:

1. improve the supply and access of data processing facilities to the ARTI staff, while carefully controling Center costs.
2. automate the data bank so that the needs of the clients are reflected in the content of the Bank.
3. provide word processing and statistical analysis support, using the computer, to the ARTI staff.

4. provide data-aquisition, survey processing, statistical analysis and word processing services to outside researchers, planners, policy-makers and others in as much as the provision of these services does not impede or impinge upon the services provided to the ARTI staff.

Ths is, by necessity, a more narrow set of objectives than what is in force at present. These objectives take into account the needs of the prioritized users, the ability of the Center to provide such services and the general utility to the Government of such services. These objectives have been discussed with a sub-committee of the ARTI Board of Governors in July of 1985 and the balance of the Plan is based on the premise that these will, in fact, be the guiding objectives of the Information Center during the medium-term future.

(1) ARTI, Information, 14 June 1984, Colombo.

(2) Charles H. Reimenschneider and James T. Bonnen, "National Agricultural Information systems: Design and Assessment", M.J. Blackie and J.B. Dent (eds.), Information Systems for Agriculture, Applied Science Publishers, London 1979.

Chapter III: Software and Hardware Improvement

A. Exisiting Hardware and Software

The computer center has, in place, a Wang VS-25 mini-computer. A procurement request has been submitted to the USAID for the purchase of a Wang PC-microcomputer to upgrade the system. The system configuration, for the VS-25, consists of the following:

(1) A Central Processing Unit with 512 Kilobytes of Main Memory, 34 Megabytes of fixed disk storage, and a 1.2 Megabytes dual-sided, double-density diskette drive
(2) One dual function terminal and two serial data processing workstations.
(3) One 30 cps daisy wheel printer, one 220 cps dot-matrix printer.

For the micro-computer (expected to be installed by end-August 1985), the following hardware is anticipated:

1. A Central Processing Unit with 512 Kilobytes of Main Memory, a 10 Megabyte Wichester Hard Disk, one 512 kilobyte double-sided, double density diskette drive, a high-resolution graphics monitor, an IBM-PC emulation card, a Wang-VS networking card and cables.
2. A 80 cps Dot Matrix printer

Software that is operational on the Wang VS-25 is as follows:

1. The VS-Operating System (6.0), including programme development tools, file management utilities and system utilities.
2. Wang Word Processing Software
3. the MINITAB statistical Package
4. Cobol, Basic, Fortran and RPG-II Compilers

For the Wang-PC microcomputer, the following software is anticipated:

1. MSDOS Operating System
2. Basic Interpretor
3. Wang-PC version of LOTUS 1-2-3
4. IBM-PC Emulation Software
5. Wang PC-VS networking software

The micro-computer can serve as an independent computer, a terminal into the VS-25 system and can transfer files to and from the VS-25 for storage and retrieval.

B. System Constraints

There are three primary constraints to the use of the existing system. These are the lack of adequate software, a storage-space constraint and the lack of a safe off-line storage medium. The addition of the micro-computer is expected to rectify the first constraint and partially alleviate the second and the third.

The software that is marketed for the VS-25 in Sri Lanka does not include a spreadsheet package, a linear programming package or an advanced statistics package. A graphics package is available, but will require the purchase of a terminal with graphics capabilities. The packages listed above are required for normal Institute applications, and are readily available for the Wang PC microcomputer. The cost of an advanced statistics package and a spreadsheet program for the VS-25 is prohibitively expensive and there is a limited variety of software packages to choose from. There is also a lack of what can be described as sufficiently 'user-friendly' software packages for the Wang VS-25. Wang's word processing package is unquestionably the industry leader in word-processing and provides a broad range of functions and facilities, but to use the package requires several training sessions. There are far more 'user-friendly' word processing packages that may not have the range and flexibility of Wang's word processing, but require less training and start-up time. The same applies to the data-base management facilities offered with the Wang. While the Data Entry, Sort and Report utilities are sufficient for simple data manipulation, they are hardly easy to teach and, in this case, relatively weak devices for data manipulation. Part of the difficulty in teaching users how to use such software is that they must have a basic understanding of the mini-computer operating system in order to manage their files.

There is a real fixed-disk storage constraint with the VS-25 system. The VS-25 provides for 34 MB of fixed hard-disk storage. Out of this, the system utilities (only a minimal-set of), the Basic and Cobol compilers, Minitab and the Word Processing System require 18 MB of storage space. Of the balance, an average use is 3 MB for word processing files, 5 MB for survey analysis data and control files, 2 MB for Minitab data files, 3 MB for Data Bank transaction files, and 3 MB for spool files and system libraries (VITOC etc.). Many of the system utilities and compilers are not being used in an effort to conserve hard-disk space. Large data-storage and retrieval jobs, such as the Data-Bank and the market research unit's survey data, must be kept primarily off-line in order to conserve storage space. For several months, on-line storage has been used at ninety to ninety-nine percent of capacity, which is too high for safe system operation and makes system management difficult.

There is also the lack of a safe, off-line storage media for the system. The costs of on-line storage are high compared to the cost of off-line storage. All off-line storage is now done on 8" diskettes. With the addition of the micro-computer, it is also envisioned that off-line storage will be on both 8" and 5-1/4" diskettes. Diskette storage is a good temporary storage medium, but is not a wise means of long-term storage. Diskettes can be easily damaged by grease, dust, fluid, heat, humidity, magnetic fields and much else. In an environment that alternates between cool and dry during the weekdays (due to the air-conditioning) to hot and humid on the weekends, it is likely that there will be diskette failure. This can be partly prevented by making multiple back-up generations and by periodically checking and transfering the diskette files to new diskettes. Since there are already approximately 130 diskettes (or an average of 9 per month produced) this will not be a viable off-line storage option for very long.

C. Future Needs and Software Solutions

There are two Institute jobs which will require custom designed software. These are the computerization of the Development Indicators Data Bank and the computerization of the Market Research Unit's survey data. For a discussion of the design strategy for the Data Bank, refer to chapter 4.

The Market Research Unit collects weekly prices for 101 distinct commodities from fourteen markets each week. Three traders are surveyed in each market. Four of the fourteen markets are outside of Colombo and there are plans to add six more out-station markets to the sample. Including codes and identifier values, approximately 33K of data must be processed each week. It is estimated that approximately 12 hours of data entry time will be required each week to enter and verify this data. The data is collected on friday, monday and tuesday and all of the summary statistics must be completed for publication by the end of each wednesday. A summary of the data and comparisons of the previous week's results must be made each week. The scope of the data collection system is being progressively increased and proposals have been made to include quantity as well as pricing data in the survey. Because the expected access rate will be high and a considerable amount of file manipulation is involved, it will be necessary to develop customized software. A systems design has been initiated for this job during July of 1985. That design should be completed and the system should be in-operation by the end of the calender year.

Other jobs that may require special processing, or custom-designed software are large or complicated survey processing jobs. By large is meant any job that will require more than two megabytes of hard-disk storage. By complicated is meant any job that cannot be satisfactorily completed using existing system utilities or software packages. The sorts of

jobs that would be appropriate for programming would be surveys that are collected repeatedly over a long-time period or where the processing requirements exceed the capabilities of the packaged software. An example of this sort of application would be the computerization of the Gal-Oya Water Management Record-Keeping survey. This was an intensive and comprehensive survey of approximately 430 farm households conducted weekly over a six year period. This would qualify for a customized software design effort because of the magnitude of the data involved and the need for careful file-structure and management.

It is not envisioned that specialized software need be designed for that survey because the research team has yet to decide what to do with the data. This is related to an important point. No spurious data should be entered or stored on the computer. Any data for which there is not an immediate processing-objective should not be entered.

Many of the existing survey-processing jobs can be done using packaged software and the Wang utilities. Since one of the Center's goals is to encourage a high degree of hands-on application, more attention must be given to training users in the use of these packages. Some of the different, discrete needs of the Institute staff, and the software solutions are as follows:

1. small survey processing: most of the surveys require simple cross-tabulation and nothing more. These jobs can best be completed using a spreadsheet or a database management package. For surveys with less than 50 variables and 100 cases, a spreadsheet such as Multiplan will be the fastest and easiest choice. For simple survey analysis work involving up to a few hundred variables and up to a few hundred observations for each variable, a database management package (such as D-Base III or Powerbase) should be used. These can be implemented on the Wang PC. For larger, but simple, survey processing jobs, a combination of the Wang Data-Entry, Sort and Report Utilities should be used.

2. Word Processing: for long text-documents that will require frequent revision and editing, the Wang word processor should be used. For short text documents or those which will require condensed printing, label preperation, custom inserts, or graphics integration, a Wang-PC based word processor should be used.

3. Graphics: Institute Reports often depend heavily on extensive use of numerical tables. The use of bar-charts, pie-charts, plots and other forms of graphics would greatly improve the visual quality and the utility of Center reports. Graphics applications should be done using the Lotus 1-2-3 package on the Wang-PC.

4. Statistical Analysis: The primary use of statistical analysis in the Institute is for model building and for parametric hypothesis testing from field survey data. For cases where under 100 variables are used, and where no integrated applications are required (eg. no graphics or finished-tables), Minitab can be used. For linear programming, the public domain Iowa State linear programming package (IBM-PC version) can be used on the Wang-PC. For more advanced applications, packages such as TSP (IBM-PC version), Micro-Stat (IBM-PC version) or Stat-Pack (IBM-PC version) can be used. It is expected that all three of these packages will be available locally by the end of the calender year. Packages that require a math co-proccessor should not be purchased (until one is available at a reasonable price with the Wang-PC in Sri Lanka).

5. Integrated Applications: There are a variety of instances where Institute reports require the merging of spreadsheet-based model results with graphics materials and text. For these applications, the use of Lotus 1-2-3 on the Wang PC would be best.

6. Library Applications: There are plans to develop a Union Catalogue of agricultural materials based on the ARTI collection. It is important that the libraries follow a similar approach to computerization in order to ensure compatability across collections. Developing custom-designed software for each library is unwise. One possibility would be to use a common data-base management package, such as D-Base II or III to build up the file system, using a standard set of codes and attribute values. Although this will likely require a small system of its' own--this should initially be implemented on the micro-computer.

One of the strategies in identifying software is select packages that are the most user-friendly, or easy to learn and use. While in certain cases more powerfull packages are available, the need to induce users to experiment with the computer facilities is a more important concern. In that same light, it is important to move away from the dependence on custom-designed software for each processing job. This is an inefficient use of the programming staff and contributes to the mistaken belief that specialized skills are required to accomplish any major computer application.

Another aim is to progressively shift more of the survey processing, word processing, data analysis and graphics applications from the mini-computer to the micro-computer. This will help to free-up hard disk storage space on the VS-25, and will allow enough terminal time for major jobs such as the computerization of the Data Bank and the

Market Research Unit survey data. This is also in line with the hardware expansion strategy which envisions greater dependence on a network of micro-computers in the medium-term future.

A final software development aim is to familiarize users with the range of software packages available on the Wang-PC. Shifting the responsibility for job-supervision and design from the computer center staff to the ARTI researchers can be implemented in stages--the first stage being the transfer of many existing applications from the VS-25 to the Wang-PC. This will be a transitional stage to the period in which the research staff has almost full control over their computer applications. This will also serve as a testing-grounds for future dissemination of micro-computers in other parts of the Institute.

D. Future Needs and Hardware Solutions

The rapid rate of technological development in small computer systems makes it incumbent upon ARTI to start to consider replacement and modification of the existing hardware at the present time. A computer system is economically obsolete when the net present value of the replacement system (taking into account scrap values and transition costs) exceeds the net present value of the existing system. To compute the net present value of a system requires a relatively clear quantification of the benefits gained from different computer systems. This is often not easy to quantify in a public sector installation. Furthermore, there are other investment criteria which do come into play when a replacement decision is being made. In a public-sector installation, it is often sufficient to select the system which is the most cost-efficient, given the workload that is to be handled. Annexure 2 provides an example of the sorts of calculations that are required to make a replacement decision. Because of the high cost of operating the Wang VS-25, and the technical feasability of shifting the Center's applications to one of the newer super-micro-computers (eg. IBM PC-AT) replacement decisions should be carefully considered. During the next two to three years, system modification decisions will likely take precedence over questions of replacement.

There are two hardware problems which were alluded to earlier, namely the lack of sufficient hard-disk storage space and the lack of a safe off-line storage medium, which will demand fairly immediate attention. Part of the storage constraint has been eased by the proposed addition of a Wang-PC with a 10 MB hard disk drive. In the future, it is likely that hard-disk storage problems will continue to plague the computer center. The choices available to the Institute are to: (1)upgrade to a VS-45, (2)add on a second 34 MB hard disk (3)add on another 10 MB hard disk for the PC or (4)add on additional PC's. If the storage constraint can be alleviated by shifting more jobs to the Wang PC, then the most efficient solution would be option 3 or 4 above. Adding

on an additional 34 MB hard disk, or upgrading to a VS-45 are more expensive options, both at the initial investment stage and in terms of a higher maintenance cost-load. For the Institute as a whole, targeting more resources towards micro-computer based applications would be a means of promoting more decentralization and a greater degree of direct user control over the processing environment.

There still remains the problem of using diskettes as an off-line storage medium. This is both a cumbersome and a relatively unsafe means of long-term storage. The options here are to (1)add on a 16000 BPI tape-drive, (2)add on a 90 MB hard disk drive with a removable fixed-disk and (3)add on a 10 or 20 MB Wichester hard disk with a cartridge back-up facility to the PC(s). At present Wang/Sri Lanka is not marketing a hard-disk with a cartridge back-up although representatives in Europe and the U.S. are doing so. The first two options cost more than $25,000 (plus a high maintenance burden) which can hardly be justified under current usage/demand conditions. The third option would be in the $2000 to $4000 range at current Sri Lanka prices but would be a rather cumbersome way of addressing the off-line storage constraint for the VS-25. By early 1986, a review should be conducted of off-line storage options and a proposal developed for the financing of some type of safe-storage device.

In the future, it may be possible to shift the bulk of the Institutes work to a network of PC's. This will be a more flexible and cost-efficient way of handling most of the forseeable Institute applications. Two years ago, when the Wang VS-25 was selected, it was certainly the most appropriate choice because no micro-computer being marketed in Sri Lanka had a suitably large memory capacity or capability for multi-user applications. The situation has changed dramatically in the past two years, with more than a doubling in the number of computer vendors, trade concessions for the import of computer equipment and the rapid growth in small-system sales (estimated by one vendor at 60% over the last two years). Although a Wang system is in place in the Institute, and the service provided by the local dealer is reasonably good, it is useful to consider machinery offered by other manufactorers when making system modification decisions. It will be important to maintain compatability with the Wang-PC, but since this is equipped with an IBM-PC emulation board, it is actually more germaine to check for IBM-PC compatability.

Future system modification decisions should reflect changes in system demands. A simple assessment of system demand should be made in calender 1986 and then again in 1988. If the demand for the computer system is at a level similar to mid-1985, and a safe back-up storage device has been provided, then no further modification is necessary. If the user demand has increased rapidly, and most of this increase is in PC-based applications, then the network of PC's should be expanded. If the increase is in applications on the VS-25, or if very large

data base jobs are anticipated, then consideration should be given to upgrading the VS-25 to a VS-45 and adding on a removable hard-disk drive.

E. System Improvement Targets and Time-Frame

Over the next five years, several improvements, adjustments and modifications in the computer hardware and software will have to be made. Certain modifications--such as development of custom-made software for unforseen needs--will be taken in response to a changing short-run situation. Other changes will reflect careful planning of computerization within the Institute. For this latter category, development targets and a phased work-plan can be specified.

A set of development targets, against which progress can be measured over the next five years is as follows:

1. The provision of custom-designed software for automating the Development Indicators data bank and for computerizing the Market Research Unit's weekly prices survey by the end of calender 1985.
2. Provision of packaged software on the micro-computer for word-processing, statistics, graphics, integrated applications and data-base management by the end of calender 1986.
3. Provision of a safe off-line storage system by end 1986.
4. A hardware configuration that meets user demand based on an assessment of the latter in calender 1986 and calender 1988.
5. A policy on replacement of the computer system drafted by the end of calender 1988.

The time frame for the activities required to achieve such targets is as follows:

Activity	Year 1985	1986	1987	1988	1989
1.custom software development					
(a)Data Bank	X	X	X	X	X
(b)MRU survey	X	X			
2. Wang-PC software procurement					
(a)integrated pack.	X				
(b)word-processing		X			
(c)advanced stats		X			
(d)data base management		X			
(e)linear programming		X			
3. Off-line storage review		X			
4. User-demand and hardware options review		X		X	
5. System-replacement review				X	

Chapter IV: The Data Bank

A. The Organization of the Data Bank

The National Agriculture Data Bank, established at the Information Center since 1979, consists of two main sections. The first is a broad range of secondary statistics, termed the Development Indicators, and the second are data sets generated by research studies, stored in what is termed the Data Archives.

The Development Indicators data base has been designed to include five major divisions: general, agriculture, fisheries, forestry and agro-manufacturing statistics. Currently, data bases have been built up for only the agriculture and the general sections of the Bank. Forty-two different organizations regularly contribute data for these bases. The agriculture section alone contains over 2,600 indicators. The development indicators have been partially computerized, and it is anticipated that the Bank will be fully automated by the end of the calender year. Notes on collection methodology, remarks about the data sets, definitions of terms used, information on legislative acts and on subsidy schemes are also available with the Bank.

The Data Archives is composed of data sets generated by research studies. Seven field surveys have been computerized. Twenty other ARTI field studies are available with the Archives in either questionnaire or work-sheet form.

The Data Bank of agricultural development indicators is divided into crops, major attribute groups, sub-attribute groups and areas. The primary key is for the twelve crop groups which are: general (all crops), cereals, legumes, roots and tubers, oil seeds, industrial crops, spices, vegetables, fruit crops, other crops and livestock. Each of these groups is sub-divided into specific crops; for example within the legumes, green gram, cowpea, dhal, soyabean and black gram are distinguished. These crop-wise bases are then broken down into twenty-eight topical attributes, such as population, land use/tenure, production, cost of production, marketing, credit and so forth. These topical categories are then further sub-divided into specific sub-categories; for example, the production category is divided into data series on area, yield and output. A third level of disaggregationn is by area. The Bank is disaggregated into twenty-five districts and two special areas.

The General Indicators Data Bank is organized by major and minor attribute groups and by geographical areas. There are eleven primary attribute groups: environment, population and vital statistics, labour and employment, housing, food, health, education, energy, transport and communications, banking and cooperative developments. These are then sub-divided into primary attribute groups; for example the food group is divided into subsidies, expenditures and legislation. This Bank is also sub-divided into twenty-five Districts and two special areas.

B. The Development Indicators

2,613 indicator series have been collected and coded. One indicator may be a set of data on a topic such as, for example, mango prices. That may contain values for as many as twenty-five years, disaggregated by urban and rural areas and then further disaggregated by district and special area. On average, there are 2,120 digits of numerical information per indicator collected. There is a relatively wide variance attached to this number, however, because some indicator series represent values taken from a Census or a field survey and may only include 10 or 20 digits. Others may run into the tens of thousands. There is also a backlog of approximately another twenty percent of the secondary data which has not been coded. Most of this is data from the General Indicators section of the Data Bank.

Of the 2,613 indicators, 27 percent have been entered into the computer. Between mid-1982 and the end of 1984, only 12% of these indicator series have been referenced at least once. Of those that have been referenced, only 36 percent have been entered into the computer. Table 4.1 below presents the number of indicators available by subject area, the number of indicators entered into the computer and the number of indicators actually referenced up to the end of 1984:

Table 4.1: Data Available in the Data Bank: Number of Indicators, Number Entered into the Computer and Number Utilized Through the End of 1984

AGRICULTURE BANK ONLY

Category	No. of Indicators	Indicators Entered into the Computer	Indicators Actually Used
1.General Agriculture	996	-	20
2.Paddy	137	371	83
3.Other Cereals	60	17	13
4.Legumes	55	24	13
5.Roots&Tubers	53	28	16
6.Oilseeds	26	8	7
7.Industrial Crops	64	10	16
8.Spices	111	50	14
9.Vegetables	117	108	73
10.Plantation Crops	494	212	21
11.Fruits	47	24	19
12.Other Crops	15	12	7
13.Livestock	204	67	19
14 TOTAL	2613	697	319

note:the number of indicators entered is through end-June 1985; number of indicators used is though end 1984 and number of indicators available is of end-May 1985.

The most commonly requested indicators are for Paddy. These are the statistics on prices, area, production and yield. Another popular category is vegetable statistics. Again, these refer to the basic production, area, yield and prices of the many different kinds of vegetables. Although such data is available on a district-wise breakdown, the great majority of users have requested only the national totals.

C. The Data Archives

The Data Archives has been designed as a storehouse of primary survey data. This data will be made available for further processing by Institute Staff or outside researchers. The surveys stored in the Data Archives are considered the property of the Information Center--and therefore available for outside use--six months after the date of publication of the ARTI survey report. The Data Archives now consists of a set of twenty secondary surveys in questionnaire or in work-sheet form. In addition, there are seven surveys which have been computerized and are available for reprocessing. These are as follows:

1. the Farm Power survey
2. the Village Irrigation Rehabilitation Project
3. the Socio-Economic Study of Inland Fisheries
4. the Energy and Agriculture Project
5. Selected Variables from the Gal Oya Water Management Record Keeping Programme
6. the Small Tank Irrigation Project
7. the Inland Fisheries Project

One limitation on the use of these surveys is that all have been stored and processed in a different fashion. Better documentation and the use of standard record formats will help to facilitate the use of this survey data.

Requests have been made to the Information Center for release and processing of surveys in the Archives. However, to date the Center has not been able to service any of these requests either because of complications arising out of releasing data before a final report is completed or uncertainty over the procedures to use. There can be no standard charge for processing an archival file since each job will be different. However, a common set of procedures should be used in each case. A suggested set of procedures is as follows:

(1) upon initial request, ascertain whether that data does exist in the computer or in off-line storage.
(2) If the user wishes to take a copy and remove it, then assess charges (if the user has finances) based on a policy of recovering 50% of the field collection costs for such a survey. This charge should be based on present field survey costs and calculated on a per-interview basis. If the customer agrees to

such charges, obtain a fifty percent deposit and arrange to handover the survey and a copy of the documentation dossier upon receipt of the balance funds.

(3) If the user wishes to process the data at the Center, then direct a member of the programming staff to estimate the processing and data entry time required. In consultation with the DPM, estimate the number of hours required to do the job and ascertain whether or not time is available on the computer for the work. If so, prepare a cost estimate (hours times Rs.200).

(4) Upon acceptance of the cost estimate, obtain an advance of fifty percent, and prepare a work schedule with the customer and the DPM. That schedule, and the fee estimate, should be approved by the Deputy-Director before a job is processed.

It is important that there is a minimum amount of red-tape involved in using the archival data. If there are considerable delays in determining the availability of data, or in having a job costed and processed, then there will certainly be no use made of this archival material. Paperwork and procedures should be kept to a minimum, especially for ARTI staff who wish to use the data for comparative or longitudinal studies.

There has been no real promotion of the Data Archives. This is appropriate until the development indicators data bank is automated and a catalog of materials stored in the Bank is prepared. After a Data Bank Manager (DBM) is hired, a promotion campaign for the data archives should be mounted.

D. Bank Usage

There has been a relatively low usage of data available with the Data Bank; both for the development indicators and especially for the data archives. In part this is due to a lack of publicity. Many potential users either do not know about the facilities availble in the Bank, or do no know how to go about retrieving such data. Another factor that limits usage of the Data Bank is the fact that many Ministries and Agencies have data banks of their own. Many individuals who might have been potential users four or five years ago, simply are not potential users today.

The number of users and the number of requests per user group is presented in table 4.2.

Table 4.2 Number of Users and Number of Requests by Institution

Users/Requests	1983	1984	1985
ARTI STAFF			
Deputy Directors	5	3	3
no. of requests	-	-	4
Research & Training Off.	17	26	16
no. of requests	93	80	38
Visiting Researchers	6	5	3
no. of requests	4	3	4
Others	1	3	5
no. of requests	13	10	6
TOTAL NO. OF ARTI USERS	29	37	26
NON-ARTI			
Research Institute Staff	2	2	1
no. of requests	3	2	1
University Staff	1	2	1
no. of requests	1	4	2
Govt Depts. & Ministries	3	4	3
no. of requests	3	8	2
Banks and Stat. Organizations	7	7	7
no. of requests	9	8	10
Private Organizations	5	5	6
no. of requests	5	14	6
Other	12	4	5
no. of requests	6	4	5
TOTAL NON-ARTI USERS	30	24	23
TOTAL USERS	59	61	49

note: number of requests refers to the number of formal requests submitted by a particular user for a development indicator. 1985 figures are from January 1 to 25 June.

In 1983, fifty percent of the users were from ARTI. This increased to sixty percent in 1984 and declined to 53 percent in 1985. The figures on Government and Ministry use of the Data Bank are indicative of the minimal amount of publicity and the lack of interest/need for such a facility. Only four people from within Government Ministries or Departments used the Data Bank in 1984; this has dropped to three persons in 1985. The fact that the Data Bank is providing services to only about 60 persons, over half of whom are inside ARTI, suggests that only a trivial amount of data-coordination work is being done. The low usage

figures by Government Department and Ministry officials suggests that the direct impact (eg. supplying relevent data directly to planners and policy-makers) is minimal.

E. The Coordination Role

The low usage rate of the Data Bank, especially by non-ARTI officials, implies that it will be difficult for the Center to play a strong role in coordinating the flow of agricultural data. Still, the Information Center can maintain an important coordinating presence without duplicating the efforts of other Agricultural Departments and Ministries.

One way the Center can serve a coordinating function is to prepare an index of data available in the agriculture sector. Such an index should include the type of indicator, collecting agency, published or non-published source, reporting and collection level and period for which the data is available. The index should also include the name of a contact-official or division where such statistics are maintained. By preparing and publishing such an index, the Center will be in a position to spot gaps in the existing data collection network and, more importantly, to link outside users and consumers of secondary data. Such an index should be published and updated every four to five years.

The Center can also play a coordinating role by arranging joint seminars with officials from Agencies that are primarily charged to collect agricltural data and those that are involved in building their own Ministry data bases. The Information Center should, through seminars and workshops, serve as a means for providing support and assistance to the various Agencies that are developing their own data banks. These agencies can benefit from the lessons learned in the Information Center and, by meeting with representatives from Collection agencies, can come to appreciate the variety of data collection systems available and the merits and demerits of different sources of data. The collection agencies will benefit from the workshops because this will provide them an opportunity to interact with those who use the secondary data for policy-making purposes. Hence, coordination in this sense will imply providing a forum for directly linking key users and producers of routine agricultural data.

Another way in which the Information Center can help to play a coordinating role is by preparing brief articles for the ARTI Current Awareness Bulletin on topics such as (a) advances in collection and reporting techniques, (b)the availability of new indicator series, (c)gaps in data collection, (d) comparisons of series collected by multiple agencies (eg. Paddy production by Census and Statistics and Dept. of Agriculture), (e)progress of data banks being developed within other Ministries and (f)abnormalities in published data series (based on consistency checks, trend comparisons etc.). Such articles should serve to

highlight a particular issue of interest. The preparation of such articles should be the responsibility of the Deputy Director and should begin by early 1986.

F. Data Collection and Dissemenation Strategy

In developing the Data Bank, a table prepared by the Deputy Director of the Information Center, showing the general breakdown of the rural sector into various topic and geographical headings, was used as a guide. Indicators which seemed to logically fall within these categories were then identified and a decision made to collect them. The Data Analysts (formerly called Data Development Officers) would bring a recommendation for a data series to be added to the Bank to the Deputy Director for approval. The Data Analysts based their recommendations on their general understanding of what the Agriculture sector includes plus specific recommendations provided by ARTI staff. Because the Data Analysts were careful to recommend only those series that would fall clearly within the broadly defined domain of an Agriculture sector, such recommendations were approved by the Deputy Director. At no time was there any formal review of usage of the Data Bank to ensure that what was collected is what is actually needed. Starting in 1984, a collection effort was mounted for general (non-agriculture) statistics. The bulk of these statistics have not been coded and, as such, are not officially part of the Data Bank.

The secondary data is either mailed directly to ARTI or is copied, at the collecting agencies office, by data assistants and casual investigators. The data is copied onto rough sheets, verified, and then brought back to ARTI where it is transfered to coding sheets and verified again. The data is then turned-over to the computer center staff for data entry. The computer staff keys in the data--plus a twenty-two digit code--into a Wang Data Entry Utility. Periodically, the staff makes back-up copies of the files created. To date, there has not been any final verification of the data because print-outs of the stored data are not available. This has been planned once the computerized system is operational.

The collection and updating of the data is done in a short-term, ad-hoc fashion. No schedule exists for updating particular indicator series or for organizing visits to collecting agencies to obtain data. Consequently, the data assistants and the casual investigators do whatever the Data Analysts instruct them to on a day-to-day basis. In fact, data updating is accorded a relatively low priority compared to collecting new series. The standard updating procedure has been to wait until a user requests the recent figures (published or otherwise) and then attempt to obtain them from the collecting agency.

The tendency to add more and more indicators to the Bank without matching data supply and demand should stop. The future strategy for inclusion of items in the Data Bank should be usage-based and only those items already requested should be placed in the computer files. Much more emphasis should be placed on ensuring that the latest figures are available and that a collection and updating schedule is prepared. Using a collecting and updating schedule will provide the staff more of a fixed structure within which to work, and will also limit the proclivity of the staff to collect more and more new indicator series. Fixing such a schedule may be difficult, because collecting agencies often do not know when data will be available. A safety margin should be built into the schedule and collecting agencies phoned in advance to ensure that they are prepared.

G. An Automation Approach

The approach to automation of the Data Bank has been influenced by a partial systems-design conducted by the Information Center staff in July 1985. In automating the development indicators data bank, that data which has been used during the past two and a half years, should be the first data entered into the Bank. This would represent approximately 800K of numerical data. The Data Bank should be an off-line data bank, until the usage level rises to such a rate as to make off-line storage impractical. The Data Bank should be disaggregated by two topics: general statistics and agriculture. A seperate section for agro-industry, forestry and fishery statistics should be built within the Agriculture section.

Seperate computer files should be built for topical areas in the General Statistics Bank and for major commodities (Paddy, Coconut, Tea and Rubber) and commodity-groups (Vegetables, Fruits etc.) within the Agriculture Bank. A hierarchical file structure should be built based on a nested code of topic, sub-topic, area, and period. Small moduler programs should be developed for request-entry, data search, data-merge, report and data-bank update. In addition, a linkage program will have to be written to transfer data from the random access file to the hierarchical file.

Under the new approach, the Data Bank will be initially about 2 MB's large. Nonetheless, this should not be stored on the hard-disk memory. Offline diskette storage can be accomplished initially with two diskettes--one for the General Indicators Series and one for the Agricultural indicators. Three generations of back-ups should be maintained. One of these should be kept with the Data Development Unit; another with the computer center and a third in storage.

A guide to using the Data Bank software should be drafted and this should be tested by the Data Development Unit staff before it is handed over to ARTI researchers. Similarly,

the Data Bank software should be tested by the Center staff and by the Data Bank staff before it is handed over to the research officers.

Periodic review and repair of the Data Bank software will be required as indicator categories are added/deleted and as the desire to obtain different output formats is voiced. One month each year for one programmer/analyst, should be set aside to review the data bank software and make changes as required by the Data Development Unit.

A set of uniform programs should be developed for accessing data stored in the Data Archives. Before storage, the data should be stored in a sequential file and the record, key and format information recorded. A set of standard file storage procedures should also be developed by the DPM to guide the programming staff in processing archival data.

H. Future Collection and Dissemenation Strategy

A strong data-demand orientation should be used to decide if information is, or is not, included in the Data Bank. There are four specific criteria that should be applied in building the Development Indicators Data Bank. These criteria are usage, topicality, ARTI-request and repeated outside request.

The most important factor that should be used in deciding whether or not indicators should be added to or deleted from the Data Bank is usage. If an indicator series is not referenced at least two times in two years then collection or updating of the series should be terminated. In this way, the automated Data Bank will eventually contain several items which have not been updated because of a lack of usage. These indicator series will be considered 'on-hold' until requests from ARTI researchers or from outside clients suggest that there is ample demand for the series. The criteria of two requests in a two year period is a very liberal criteria and is set at such because of the limited publicity and exposure that the Data Bank has had. Starting in 1987, this criteria should be increased to two requests per annum and should be maintained at that level until 1989.

A second criteria that should be used is topicality. If, for example, the Information Center staff envisions a need for inclusion of a particular set of statistics because of a shift in government policies or priorities, then a case can be made for including those statistics in the Data Bank. For example, the National Food, Agriculture and Nutrition Strategy (1984) envisions the development of new project activities in watershed management, smallholder tea and rubber, coconut intercropping and irrigation rehabilitation. Because each of these investment areas cross clearly defined bounds of administrative authority, the statistical collection and reporting systems are relatively incomplete. The Data Bank could select one of these specific investment areas, or another area related to a specific policy

initiative and build a small sub-set of indicators into the Data Bank. Before any indicators are added on the grounds of topicality, however, the following should be formally accomplished:

(1) a written declaration providing evidence of topicality should be prepared. That declaration should include the rational for regarding such topics as important and timely and should also indicate what data series are to be collected.
(2) A strategy for marketing this set of topical indicators should be drafted. This should identify the logical end-users of the series and the means by which such users will be induced to use this data.
(3) Items 1 and 2 above will be approved in writing by the Deputy-Director of the Information Center before collection of the secondary data commences.

These procedures are rather cumbersome and formalistic, but are necessary to ensure that spurious data is not included in the Data Bank on the grounds that it is topical.

A third factor that should be considered is user demand within ARTI. If a researcher in ARTI requests a specific package of indicators be added to the collection, then every effort should be made to do so. However, again the request should be documented and approval obtained from the Deputy-Director of the Division. After becoming a part of the automated Data-Bank, the usage test should be used to decide if the data remains in the Bank. This inclusion-criteria is in keeping with the policy of gearing Information Center services to the needs of the ARTI researchers.

A final criteria for usage should be the repeated-demand for a particular set of indicators by outside users. If a particular indicator series is requested three times within a calender year, then a proposal for inclusion should be submitted to the Deputy Director of the Center for approval. After such a series is added to the Bank, the usage criteria should be used to determine the lifespan of the series in the Bank.

A catalog should be prepared and should provide the following information for each indicator series:

1. indicator description
2. source (collection agency and document)
3. time-period (first to last date, monthly or annual)
4. area level (national, district,both)
5. computer access code

The Data Bank should also maintain a list of all indicators available with the Bank that are not computerized. This list should include items 1 to 4 listed above. This list can be used to select indicators that should be considered for inclusion in the computerized Data Bank.

An off-line register should also be maintained providing relevant details about collection methodology and primary reporting procedures. For each indicator included in the computerized Data Bank, a listing should be made in the Collection Methodology register. This register should be prepared and up-dated on the word-processor and print-outs of relevant pages provided to Data Bank users upon request.

The Data Archives should contain,as a start, the primary surveys collected by the ARTI staff. Each survey on deposit with the Archives should be in a form that makes re-processing relatively easy. For this reason, it is preferable to analyze the surveys using either Wang-utilities or packaged micro-computer softwear if possible. When not being used for processing, these surveys should be stored off-line on diskettes. A seperate file of these diskettes should be maintained with the Data Development Unit. The Data Development Unit should also be responsible to ensure that, for each survey, there is a survey-dossier containing the following:

(1)a copy of the survey questionnaire
(2)a statement of sampling procedure and collection methodology.
(3)a list of the variables available and the definition of such variables.
(4)a detailed description of the file specification (file name, type, record legnth, keys, coding format)
(5)specification of the control files (program names and functions)

In the long-term, other researchers can be invited to deposit surveys with the Data Archives. In the near to medium-term, this is not a very practical option because of the need to gear the computer facilities to meet internal ARTI needs. If, however, a specific researcher requests that an outside-survey be added to the archives (for Institute related processing) and has obtained the permission from the cooperating Institute for the release of the data, then every effort should be made to obtain and include such data. Strong publicity and outreach efforts are needed for the archives, particularly within the ARTI. Researchers should be convinced that the archives can be used as a data-source for multiple assessments and for time-series analysis.

I. Development Targets and Time-Frame

A set of development targets for the Data Bank is as follows:

1. Computerization of the agriculture data bank, starting with the 12 percent of the data previously requested based on an off-line storage and retrieval system.
2. Preparation of a development indicators catalog.
3. Preparation of an agricultural statistics index.

4. Annual user/supplier workshops.
5. Publication of user awareness articles about agricultural data.
6. Institution of a formal review process for adding and deleting indicators from the data bank which is based on use, topicality, ARTI request and outside demand.

A timeframe for the implementation of activities leading to the achievement of the targets cited above is as follows:

Activity	1985	1986	1987	1988	1989
1.Data Bank Computerization					
(a)design completion	X				
(b)testing and handover	X	X			
(c)general indicators comp. design		X			
(d) testing and handover		X			
2. Coordination					
(a)agr. data index prepared		X			
(b)agr. index published		X			X
(c)awareness notes published		X	X	X	X
(d)user/supplier/data base builder seminars		X	X	X	X
3. Collection Strategy					
(a)adoption of user-based collection principles	X				
(b)implementation of new guidelines for adding material to the Base		X	X	X	X
(c)preperation of a collection time-schedule		X			
4. User Aides					
(a)preparation of a catalog of data in the computer	X	X			
(b)preparation of a register of meta-data		X			
5. Survey Archives					
(a)preparation of a set of procedures for accessing the survey archives		X			
(b)dev't of a targeted publicity campaign			X		

Chapter V: Manpower and Training

A. Staff Supply and Background

The composition and quantity of staff in the Data Development Unit and the Computer Center has changed markedly over time. At present, there is a staff of twenty-two officers, including the Deputy-Director and six casual investigators. Out of the twenty-two, eleven officers work with the Data Development Unit, eight with the Computer Center and three with Information Center Administration. Of the twenty-two, only three have a University diploma, although ten have had varying amounts of training in computer science and four have had training in statistics. Only one position is vacant, and that is for the Data Bank Manager. Except for the Data Processing Manager, who was appointed very recently, all of the other senior Information Center staff have been with ARTI more than seven years. A profile of the Information Center staff is provided in table 5.1.

B. Future Labor Demand

A qualitative estimate of future labor demand can be based on a projection of likely job requirements for the Computer Center and the Data Development Unit. The specific types of skills required for each type of job can be abstracted from the aggregate job requirement estimate.

With the plans to have a vastly scaled-down Agricultural Data Bank, that is geared primarily to serve ARTI research needs, the labor requirements for the Bank will diminish appreciably. At present, approximately 12 to 15% of the data available with the Bank has been used--either by the ARTI staff or by outside users. The labor requirments for the exisiting Data Bank are one full time Data Bank manager (a vacant post), 2 Data Development Officers, 3 Data Assistants and six Casual Investigators. The Development Indicators work absorbs nearly 100 percent of the time of all of these officers, plus nearly two-thirds of the time of the three data entry officers. Assuming that the collection effort is scaled down to twenty percent of what it is now, this would imply that less than one-third of the collection, transcribing and data entry effort would be required. Under such circumstances, the six casual investigators would be largely redundent. Efforts should be made to locate alternative positions for these individuals within the Institute.

Additional labor demands will be placed upon the Data Development Unit to develop and maintain a catalog of data sources and contact individuals for data collected in the agriculture sector, to organize seminars, to organize an outreach campaign for the Data Archives and the Development Indicators Data Bank and to update the Data Bank. These activities will likely require the full attention of the data development officers and the data bank manager.

Table 5.1 Staff Profile

Name(Age)	Position	Education	Computer-Training	Years At ARTI
A. SUPERVISION AND SUPPORT				
1.T.Shanmugam (54)	Deputy Director	BSc.-Ceylon Post-Grad Dipl. in Math Stats.	NIBM course, Wisconsin summer training	12
2.GK Ibrahim (24)	Steno/ Typist	GCE (A/L)		2 mo.
3. M. Fernando (24)	Peon	SSC (O/L)		3
B.COMPUTER CENTER				
1.MW Jayawardene (38)	D.P.M.	B.A. (Univ. of Ceylon-Peradiniya) Banking Diploma Part I	Comp. Data Systems (US) Comp. Editing and Imputation Systems (ESCAP) 10 courses on programming and systems from IBM	3 mo
2.JM DeSilva (34)	Analyst/ Programmer	GCE (AL)	NIBM Diploma Advanced Cobol Systems Training at ISPC (USA)	11
3.R Amarakoon (33)	Analyst/ Programmer	GCE(AL)	NIBM Diploma Advanced Cobol Programming and Data Structures (Cornell Univ.)	7
4.KDS Perera (24)	Trainee Analyst Programmer	BSc. (maths/stats)	Certificate in Comp.Sci. and Business Management (Fortran and Basic)	1
5.MLK Siriwardene (21)	Data Entry Operator	GCE (O/L) GCE (A/L)	10 Month Private Programming Course	1
6.M.Pathiraja (21)	Data Entry Operator	GCE (O/L) GCE (A/L) GCE (O/L)	First Year of a Certificate Course in Electronic Tech.	1
7.TMH Jayasinghe (21)	Data Entry Operator	GCE (A/L) GCE (O/L) ICMA Section A	Radio Shack Basic Programming	1

---table 5.1 cont.

8.NC Wickramasinghe (24)	Steno/ Word Pro	GCE (A/L)	Wang WP Training	3

DAA DEVELOPMENT UNIT

1.ENR Fernando (34)	Data Analyst	GGE (A/L)	Wang Cobol/Pace	12
2.KDS Ariyasinghe (36)	Data Analyst	GSQ (first ex.)	Wang Cobol	12
3.M. Subasinghe (22)	Data Assist.	GCE(A/L)	Fortran Certif. Course, IDPM-London External course.	3.5
4.SA Majeed (24)	Data Assist.	BSc.		9 mo
5.AAP Liyanage (22)	Data Assist.	GSQ		9 mo
6.KGGS Wanigasinghe (21)	Casual Investigator	GCE (A/L)		2
7.JBK Pussegoda (27)	Casual Investigator	GCE (A/L)		2
8.P.Ranasinghe (32)	Casual Investigator	GCE (A/L)		1
9.SPM Gunwardena (23)	Casual Investigator	GCE (A/L)		1.5
10.ND. Jayanetti (23)	Casual Investigator	GCE (A/L)		1.3
11.JM Hathurisinghe	Casual Investigator	GCE (A/L)		8 mo.

On the computer center side, there will be several different sorts of labor demands. Judging from past experience, an average of 4 to 6 ARTI field surveys will require processing each year. Of this, more than half can, and should, be done by the researchers themselves on the micro-computer. One programmer and one full-time data entry operator should be able to manage this survey processing load. The two custom-designed software jobs for the market research unit and for the data-bank will require a great deal of initial development effort in 1985 and thereafter a fairly steady maintenance effort. The market research survey processing will require frequent revision as new uses are made of the data. Both of these jobs combined will require one full-time data entry operator and at least one programmer half-time. The computer center will have to absorb a much heavier training responsibility than has been the case to date. The training load envisioned will require (see section E) fifty percent of the time of the data processing manager, one full-time programmer and one-quarter of the time of the word processing operator. At present, approximately 200 pages of word processing material, per week, is processed at the computer center. This can be expected to rise as knowledge spreads of the word processing facilities. Because of limited terminal facilities, the services of one word processing operator should be sufficient. Approximately twenty percent of the time of all computer personnel will be needed for system maintenance (back-ups, security procedures) and clerical activities (logbooks, supplies etc.). The present size of the computer center staff is well suited to the forecast labor demand. The primary shift, however, will be from the concentration on provision of programming services to a greater attention towards user-training.

C. Important Issues in Manpower Planning

The labour market for computer programmers, data entry operators and, most importantly, systems analysts is highly competitive, with private sector salaries ranging from two to ten times the level of public sector renumeration. In such an environment, with rapid growth in both public and private sector computerization, it is likely that there will be a loss of computer center staff to competing Institutions. The provision of short-term training opportunities, both domestically and abroad, coupled with bonding, will serve to discourage attrition. There are very few internal opportunities for job-mobility, and this will doubtlessly encourage staff to seek work elsewhere. In the event of a loss of one or more of the programming staff, it is recommended that the trainee programmer be levated to the position of programmer and that either a data entry operator or one of the data development officers be provided an opportunity to become a trainee programmer. In the event of the loss of the DPM, it is suggested that the two analyst/programmers be given the joint responsibility for system management and that an outside consultant be identified to assist the Center on a periodic basis. There is, in fact, little the Center can do to avoid the loss of staff in such a competitive labour market.

However, staff-replacement must be considered at all times and contingency plans prepared to identify staff replacements at short notice.

Within the medium-term future, it is likely that the Deputy-Director of the Information Center will retire. As this officer has played a strong and leading role in the development of the Center, her replacement must be identified and prepared well in advance. The replacment should possess very strong administrative skills since the bulk of the responsibilities of the Deputy Director are in administering to, and planning for, the needs of the staff and facilities in the Center. That officer should also have a background in statistical methods since one of the responsibilities of the Deputy-Director's post is to provide statistical consultancy to ARTI research officers. In accordance with Institute policy, it would be best to identify a research officer with aptitude in both statistical methods and administrative service and train that officer for the post. If no suitable candidate is available within the ARTI, then an outside candidate should be identified. A third alternative is to identify a candidate from within the Information Center, who meets the requirements listed above and has long experience with the Institute. It is important that this be done no later than calender 1986 in order to allow for a suitable transition/training period for the new Deputy-Director.

D. Center Staff Training

There is an on-going need for skill improvement in the Computer Center and Data Development Unit. Staff training is required, in particular, for the computer center programmers/ analysts in micro-computer applications. Training is also required for the Data Processing Manager in management techniques. Similar training may be required for the Data Bank Manager in business management/marketing.

There are four types of facilities that offer computer science training in Sri Lanka. The first of these are the several small private organizations that teach programming or the use of a packaged programme. None of these organizations enjoy a very good reputation and the level of instruction does not appear to be good. Since training in programming per-se is not an immediate medium-term need (unless staff replacement is required), there should be no reason to utilize such services.

A second training option is the University of Colombo's Department of Statistics and Computer Science. The Department is one year into their first degree course in computer science and is offering external courses in programming in the evenings and weekends. The curriculum at the University of Colombo is geared to providing an individual with a sound background in Maths, Statistics and Software. The University is now considering instituting a graduate programme in

Computer Science, with Japanese Aid assistance. The programme will only be open to recognized University graduates, which rules out the senior programming staff. It may, however, be advisable to send the trainee programmer or the replacement for the Deputy Director for training to this graduate programme. Since the graduate programme is at least one year away from existence, it is premature to make a strong recommendation one way or another. However, this training option should be carefully considered.

The National Insitute of Business Management offers a nine month intensive training course in computer programming and systems management. Two of the analyst/programmers have completed that course. The course provides an introduction to four programming languages, file structures and systems design. The course is heavily geared to commercial business applications, although a special effort is made to provide some examples of relevance to public-sector institutions. NIBM provides instruction on a Wang VS system, which enables a measure of continuity between the training facility and the workplace. Judging from staff performance, the NIBM training is relatively good preparation for programming but the other topics are not covered in sufficient detail to have much of an effect. If, however, it becomes necessary to replace one of the programmers/system's analysts over the medium-term future, enrollment of the replacement in NIBM's nine-month course may be required.

The other institution which provides relevant training is DMS/Wang. DMS offers local courses in word processing, programming, micro-computer application, systems management, systems analysis, and VS operating principles and applications. Several of the Institute secretaries have followed training courses in word processing at Wang. It will be useful to send the Center Secretary to DMS for word processing training during the next calender year. The two Data Analysts have attended a training course at Wang and the two programmer/analysts have attended courses in VS-Utilities. During the next five years, the programmer/analysts and trainee programmers should obtain training in micro-computer applications. This should also be offered to the Data Analysts and the Data Processing Manager as well. One of the programmer/analysts has already recieved such training during his study tour in the United States. The other officers should attend the course at DMS-Wang on MS-DOS (PC.01), the course on Multiplan (PC.03) and the course on Lotus 1-2-3 (PC.04). If a group of six officers is trained at one time, then it will be possible to design a special course to meet Institute Applications.

It is important to locate a suitable course in business management for the Data Processing Manager and possibly for the Data Bank Manager. Both the National Institute of Business Management and the Sri Lanka Institute for Development Administration offer degree programs and short-courses in

business management. For both officers, a short course in personnel management, financial planning and marketing would be useful. Such training should be provided within the medium-term future.

Short-term overseas training has been provided for six Information Center officers under the USAID assisted Information Center Project. In the near-term future it is unlikely that the supply of overseas training opportunities will (or need be) be as great as during the past two years. It is important, however, for the Information Center to try and maintain contact with other Institutes in the region that provide data-bank and research support services. Funds should be actively sought for periodic study tours to regional centers such as the Asian Institute of Technology, ICRISAT, and IRRI.

There is a need to increase the qualification levels of the data development officers and the programmers/sustems analysts. None of these officers holds a University degree. While these officers are certainly well-trained and competent in their jobs, it is difficult for them to interact professionally with the ARTI research officers without such degrees. Special funds should be provided by the Institute to finance external degree training for these officers. These officers should qualify for a University degree or for the British Computer Society Diploma.

E. ARTI Staff Training

Training is required for ARTI staff in the use of the computer and in the use of the resources in the Data Bank. For the latter, the Data Bank staff must prepare a User's Guide to the facilities. This should be prepared along with the computerization of the Development Indicators Data Bank.

There is a need to organize a systematic training programme within the Computer Center for ARTI staff. A series of training courses should be held, each year, on survey processing, word processing and statistical analysis. The course on word processing should cover the use of the Wang Word Processor and word-processing on the Micro-computer (with wordstar). The survey processing course should cover the use of the Wang Data Entry, Report and Sort utilities plus the use of a data base management course on the micro-computer (likely D-Base III). The statistical applications course should cover the use of Minitab on the VS-25 and Lotus 1-2-3 on the micro-computer. Each course should be approximately one week in length and limited to 4 or 5 students. The Center staff must prepare appropriate handouts and course materials for these in-house study sessions.

In addition, it would be useful for the researchers to have the opportunity to attend a series of courses on micro-computer applications at DMS-Wang. It would be useful for a

group of six to eight researchers to attend the following sequence of courses at DMS-Wang:

PC.06: Micro-Computers as a Management Tool
PC.01: MS-DOS Operating System
PC.03: PC Multiplan
PC.04: Lotus 1-2-3

These courses would require three weeks in total to complete. This would serve as a good means of introducing the researchers to the different software options on the PC and, coupled with the in-house training provided by the computer center staff, should provide a strong basis for Institute applications.

Several research officers have suggested that the Computer Center staff develop simplified manuals, preferably in Sinhalase. This is not a wise use of limited manpower resources. The language of computer science is, for the time being, english and there is no chance that popular software packages will be available, in the medium-term future, in Sinhalase. None of those associated with the Computer Center possess the requisite skills required for manual writing and this should not be expected of them. However, the training materials that are prepared for the in-house training sessions of the research officers should provide simplified examples of various applications on the computer.

F. Manpower and Training Targets and Goals

Medium-term targets can be set to guide manpower and training planning. These targets represent the outputs expected from a set of manpower and training activities:

1. Identification and recruitment of a Data Bank Manager by 1986.
2. User training sessions held for ARTI staff by DMS-Wang and by the computer center staff.
3. Training sessions held for Information Center staff according to the training plan.

A timeframe for implementation of the major activities cited above is as follows:

Activity	1985	1986	1987	1988	1989
1. Recruitment of a Data Bank Manager	X	X			
2. Data Bank Staffing Review	X	X			
3. Contingency Planning for Computer Staff Replacement	X	X	X	X	X
4. Recruitment for Deputy Director Replacement		X	X		
5. Information Center Training on Micro's(5 off)	X	X			
6. Business Training for DPM and DEM		X	X		
7. External Degree Training for Programmers and Data Analysts		X	X	X	X
8. Regional Visits and Training			X		X
9. ARTI staff training in WP, survey processing and stats applications					
(a)Class Materials devd.	X	X			
(b)Classes conducted		X	X	X	X
10. DMS/Wang Micro-computer training for research officers (5)	X	X			

Chapter VI. Publicity and Outreach

A. The Need to Publicize Information Center Services

The services provided by the Information Center must be actively promoted in order to build up a strong customer base and to ensure that users'desires are reflected in the service offerings of the Center. A strong marketing/promotion orientation will ensure that the Information Center remains a dynamic body, changing as the needs of users change.

Promotion and outreach of the Information Center Services is also required within the ARTI itself. More than fifteen months after the computer center was installed, less than a handful of researchers use the computer facilities. Part of the reason for this is a lack of understanding, on the part of the staff, of the facilities offered. In addition, there is a great deal of fear and uncertainty over the level of technical knowledge required to use the computer. Active promotion and outreach, within the Institute itself, is required if these fears and mis-understandings are to be overcome.

Promotion efforts are sorely needed for the National Agricultural Data Bank. In 1985, only nineteen out of thirty-six professional researchers within ARTI made use of the data bank. Only twenty-three other persons, outside of the Institute, made use of the Data Bank during the first six months of 1985. Promotion efforts are needed, in the first instance, to increase the volume of users accessing the Data Bank. Market promotion efforts are also needed to identify those factors that will induce repeat-usage of the facility.

There are two keys to success in marketing. The first is to supply a high-quality product. The second is to do everything possible to satisfy the customer.

For the ARTI Information Center, the supply of a quality product means that the needs of the important users are satisfied in the best fashion possible. This implies that, ARTI researchers should be able to obtain on-site computer traning, have access to clear manuals, be able to follow clearly established system usage procedures and have access to a trained staff who are willing to help them with their queries. With respect to the Data Bank, this implies that the information available is clearly documented, that there is easy and reliable access to the data for the users and that the outputs produced are in a desirable form.

Successfull marketing hinges upon the spirit with which products are promoted. Some products, which enjoy a strong reputation, can be passively promoted because of their strong following or history of past performance. This is not the case with the products of the Information Center. Strong, active promotion efforts will be required to make the market and to build a customer base.

B. Previous Promotion Efforts

A relatively modest amount of attention has been given to the publicity and outreach of the Information Center's facilities. Activities which have been carried out to date, and which can be construed as primarily promotional include:

1. An Inauguration was held for the Computerized Data Bank on June 14, 1984. This was attended by the Minister of Agriculture and was followed by several weeks in which the data bank facilities were displayed.
2. An Information Bulletin was printed and distributed at the Inauguration.
3. An article about the ARTI Data Bank was prepared by Dr. Mohan Munasinghe and was printed in the Sun newspaper.
4. An article about the Data Bank and the Computer Center was printed in the Guvijanathawa Journal published by ARTI in 1984.
5. A Data Bank bulletin was prepared for publication in July of 1985.
6. Three sets of training sessions were conducted by foreign consultants for the ARTI research staff on computer methods and techniques. Special sessions were held at ARTI by WANG software support staff on computerized data entry and retrieval methods.

The success of these promotion efforts can be measured by the extent to which users have become actively involved in using the Center's facilities. Since this remains low it either implies that the services being marketed are not suitable or that the services have not received adequate promotion.

In the early stages, it is wise to minimize the amount of publicity provided until the Center's services are in a good, working order. There is, however, a cost attached to minimizing the amount of publicity provided during the start-up phase of the Center. In particular, this can result in a false sense of security, on the part of the staff, because they are not constantly challenged to supply 'marketable' services. There is also the danger that an in-breeding of ideas and concepts will develop. The result of this is that the Center staff is no longer responsive to the ideas and desires of the users but acts based on it's own ideas and desires.

C. Outreach and Promotion Responsibilities

The ARTI Information Center staff are not accustomed to the idea of vigorously promoting the use of their services. Interviews with the staff revealed that there was a general lack of familiarity with promotion techniques and more seriously, a lack of desire to actively market the Information Center's services. Efforts must be made to change staff attitudes. The staff must come to understand that promotion/outreach

activities are a fairly high priority item and that the success or failure of the Center depends on the degree to which the user population is expanded and is involved in defining the services provided.

The Data Bank, in particular, will require a great deal of publicity once it is automated. The Data Bank manager post should be filled by an individual capable of developing a marketing outreach campaign for data bank services. The primary responsibility of such an individual should be to develop and implement a promotional campaign. This individual should also serve as a link between the users and the data bank staff to ensure that the Bank is kept up-to-date and has the material required to satisfy the user's changing needs and desires. This same individual should have some training in statistics and data collection methods in order to make intelligent operational decisions and so that appropriate outreach materials can be prepared.

The ARTI Publications Unit maintains a cadre of Information/Outreach officers who specialize in the publicity of Institute materials. In some cases, the publicity services provided by this Division are excellent. A good case in point is the publicity provided to the messages in the Market Research Unit newsletter. The findings from the market survey conducted by ARTI are transmitted weekly to the public by newsletter, television, radio, and newspaper. As a result, there is a high degree of awareness of the market research service provided by the Institute. Officers from the Publications Division have indicated a willingness to assist the Information Center in it's outreach efforts. This offer should be accepted and full use made of the publicity-specialists working in the Publications Unit.

D. Targeting Outreach Activities to Client Groups

Specific outreach efforts must be designed for the different types of user-groups. For the ARTI researchers, in-house training sessions, brochures, seminars and local-area training are the most likely means of encouraging greater participation. For agricultural researchers outside of the Institute, a combination of informational-brochures, special seminars, notices in other ARTI publications and targeted mailings should be sufficient to build up a steady clientele. For planners, policy-makers and others not in the government service, direct-mailings plus occassional newspaper and radio spots should guarantee their interest.

The Information Center has a range of services it can provide, some of which appeal to one set of potential customers and others which will not. For example, agricultural researchers from Peradiniya may find that the Data Bank is useful and for that reason alone they come to the Center. However, these same researchers will likely not be interested in the word-processing

facilities offered at the Center because such facilities are also offered by their own Institutes. The Information Center should be promoted using the concept of an 'integrated service center'; in other words, of a facility where several different forms of services related to data aquisition and processing are available. At the same time, it is important that several 'service-lines' within the Center be clearly identified and turned into marketable products. This is already the case with the Data Bank, the survey analysis work and the word processing. Two additional service-lines that could be developed include statistical analysis and graphics production. Each of these services should be independently promoted, but always with mention of the total set of services provided at the Center. It is unlikely that a customer (eg. either within or outside of ARTI) will come for the first time to the Center in order to take advantage of the full range of services. Nor does that customer need to be fully informed about the full range of services offered before using one of the services. Gradually the user's awareness of the full range of services can be built up and the customer will use the Center as more than a single-service outlet. A high degree of staff teamwork will be required to bridge the gap between a user's initial desire for a particular service and his later use of the Center as an integrated service facility.

Promotion Targets and Implementation Timeframe

Promotion activities must be designed and revised according to the extent to which greater Center usage is desired. This will change over time. Yet, in the near-term future, publicity and outreach efforts will have to be accorded a fairly high priority in order to build up a steady customer clientele.

A set of promotion and outreach activities for the Information Center, during the near and medium term future, follows:

1. A mailing/telephone list of different users of the Information Center be developed and updated continuously. This should be initiated by the begining of calender 1986.

2. A set of brochures be prepared on each of the services provided by the Center, namely word-processing, survey-analysis, statistical analysis and the use of the Data Bank. As further service lines are added, additional brochures should be developed. These initial brochures should be available by mid-1986.

3. A comprehensive catalog of indicators available in the data bank should be prepared.
   The catalog should contain a description of indicators, source, time period, data level, and computer access code. An initial draft of the catalog should be prepared by early 1986.

4. Training seminars should be held annually by the computer center staff on the use of the Wang Utilities for survey processing, word-processing, and Minitab. These seminars should begin in calender 1986 and a minimum of one seminar per year should be held.

5. One seminar per year should be organized by the Information Center staff on a topic related to agricultural data processing or agricultural data management. Local experts should be called upon to participate. Seminars should begin in 1987.

6. Once the Data Bank is automated (estimated 1986), a promotional brochure should be distributed. From then on, a quarterly contribution to the Market Research Unit newsletter should be prepared on data (or meta-data) of interest in the agriculture sector. This should be underway by early 1987.

7. An annual survey of Information Center users should be held to identify new services to provide and ways to improve existing services. Responses should be collected by the senior Information Center staff. Surveys should be initiated in mid-1986.

A consolidated time-frame for the promotional activities cited above is as follows:

Activity	Year				
	1985	1986	1987	1988	1989
1. Mailing/Phone List					
(a)draft developed	X				
(b) updated		X	X	X	X
2.Service Brochures					
(A)Data Bank	X				
(B)WP Services		X			
(C)Stat Services		X			
(D)Survey Analysis		X			
(E)New Service Lines			X	X	X
3.Data Bank Catalogue					
(A)Draft Prepared		X			
(B) Updates Released			X	X	X

4. ARTI Staff Seminars				
(A)Word Processing X	X	X	X	X
(B)Survey Processing	X	X	X	X
(C)Statistical Analysis	X	X	X	X
(D)Other new applications		X	X	X
5. Research Community Seminar		X	X	X
6. Data Bank Publicity				
(A)brochure distributed	X			
(B)info-note in MRU newsletter		X	X	X
7. User Participation Survey	X	X	X	X

The execution of the above activities, according to the time-frame suggested should result in an improved user participation rate. Some suggested targets to aim for during the medium-term horizen are as follows:

1. ARTI Staff Participation in the Information Center:
   a. Ninety percent of the research staff regularly using the Data Bank by 1989.
   b. Fifty percent of the research staff engaged in hands-on use of ARTI computer facilities by 1989.

2. Non-ARTI staff:
   a. A twenty percent rate of growth in the number of non-ARTI staff accessing the data bank by end 1986. Thereafter a ten percent rate of growth in non-ARTI Data Bank clients each year.
   b. A minimum nuber of two requests serviced for data from the data archives section of the Data Bank per year begining in 1987.
   c. A minimum number of two outside survey analysis, or word processing, or graphics or statistical analysis jobs processed at the Information Center each year.

Chapter VII: Cost-Control and Revenue Generation

A. Financial Objectives

The Information Center cannot expect to cover it's costs while primarily providing a public service. At the same time, the Center should strive to work in the most cost-efficient fashion and should generate revenue when providing commercial services. Projects should be individually costed, whether such costs are recouped or not. A financial summary of the operating costs and revenues of the Center should be prepared annually and discussed with the staff.

Although the Center cannot operate on the lines of a profit-making institution, every effort must be made to minimize waste and inefficiency. Greater staff awareness of the need to reduce costs and to increase operating efficiency is required. This can be accomplished through frequent cost-reviews and through a periodic external audit of the Center's facilities. If the Information Center has a high operating cost, compared to other research institutes, then this will drive the ARTI into a non-competitive position when bidding for research grants. The high costs must be covered through direct Ministry funding or, alternatively, through project-tied financing. Since these costs will impact upon the financial competitiveness of the Institute as a whole, close attention to these costs by the ARTI management is advised.

B. Review of Cost and Revenue Status

The costs of operating the Information Center can be divided into fixed (or sunk) costs and variable costs. Fixed cost elements include electricity, air-conditioning and capital depreciation. Variable costs include supplies, software, labor, computer maintenance,training, transport and publicity. No building or supervision cost has been included because that would represent a double-counting of expenses within the Institute. This could be incorporated, however, by adding a standard overheads figure of 25 percent as is done in certain Institute projects, although this is only a rough approximation of true overhead costs.

Total fixed and variable costs are presented in table 7.1. Several of these items require explanation. A depreciation charge of Rs.11,250 per month was listed as a fixed cost. This is based on the assumption that the Information Center chooses to gradually replace the VS-25 with a network of micro-computers over a five-year period and that Rs.135,000 per annum is required for replacement. Although it is not a standard accounting practice for Government agencies to establish a sinking fund to cover replacement, depreciation should still be costed-out in order to give an accurate picture of the running costs of the Center. In fact, a very low depreciation value has been used, and this is based on straight-line replacement rather than any form of accelerated or historical depreciation accounting. No

funds have been specifically budgeted for publicity, but a cost based on standard printing charge rates was assumed.

A breakdown of the labour charges is as follows:

Staff	Bundled Salary and Emoluments (Rs.per month)
Deputy Director	4250.
Data Bank Manager	4000.
Data Processing Manager	4000.
Data Development Officers (2)	2200.
Analyst/Programmers (2)	2200.
Data Devt. Assistants (3)	1500.
Steno/Typists (2)	1500.
Data Entry Operators (3)	1800.
Casual Investigators (6)	1500.
Office Aide (1)	1100.

Estimating the revenue side of the Center is complicated by the fact that during the initial stages of Center operation, some services were provided for free while others were charged on a rather ad-hoc basis. These figures do not necessarily reflect the Center's revenue potential, as many services were provided free-of-charge, or at a heavily subsidized level, during the initial breaking-in period of the computer center. A monthly revenue estimate, based on the first six months of 1985, is as follows:

data bank development indicators:	Rs.122
survey processing: (energy and agr., manpower and Mahawelli radio studies)	Rs.1400
word processing: ('84 figures)	Rs.500

TOTAL: 2022

This is approximately 2.3 percent of total operating costs. However this figure does not include the charges levied on project funded ARTI staff for survey processing, nor charges levied for the use of Minitab. Since there are no records of such charges, the estimate given above shall stand.

Table 7.1 Operating Costs of the Information Center

	(Rs./month)	(%)
a)Fixed		
1.Depreciation	11,250	13.0
2.Air-conditioning and electricity	4,500	5.3
b)variable		
1. Supplies (paper,ribbons and diskettes)	2,700	3.2
2. Software (minitab rental)	1,125	1.3
3. Labor (see list above)	42,250	48.9
4. Maintenance ($728/month)	19,660	22.7
5. In-country training	1,250	1.5
6. Data-Bank supplies	500	.6
7. Data Bank Transport	500	.6
8. Publicity/Seminar Costs	2,500	2.9
TOTAL	86,235	100

C. Cost-Control Options

One way of containing operating costs would be to reduce the cadre of casual investigators. Since the workload planned for the Data Bank does not require such a large collection and coding effort, these workers can be released. That would save the Center Rs.9,000 per month in operating costs.

Another area where the Center can save funds is through a re-negotiation of the service agreement with DMS-Wang. Initial meetings with Wang officials have been held for this purpose in July of 1985. The existing maintenance agreement is for $728 per month, or twelve percent of the historical cost per annum. This cost is approximately twice, in percentage terms, what the USAID is paying Wang for it's service contract. In a recent procurement bid, DMS-Wang offered hardware support services for new machinery at an annual effective cost of 4 to 6% of the hardware cost. Also, the DMS service charge is based on historical costs, although the replacement cost of a VS-25 (with a newer Vs model) would be approximately thirty percent less than the historical cost. The DMS-Wang officials have indicated that they are in the process of revising their maintenance charge policy. A reasonable service-charge level, based on replacement value and competitive charges with other mini-computer dealers would be 8 percent of the replacement cost per annum, or $382 per month. This would amount to a savings of Rs.9,340 per month over existing charges. If a network of PC's is used to eventually replace the mini-computer, then an as-needed service agreement should be taken. This would reduce the maintenance requirement even further and would allow the Institute to competitively select a maintenance contractor.

If the Center can attract foreign grant financing for the gradual replacement/modification of it's hardware, then the Institute can 'cost-out' the capital cost of the system at zero. In other words, if the foreign financing could not be used for any other purpose within the Institute, there is a zero opportunity cost attached to such funding. Since depreciation represents nearly 20% of the operating costs of the Center, this would be a substantial savings (or accounting transfer) amounting to a conservative estimate of Rs.11,250 per month.

Another way to cut-costs would be to cancel the up-date rental for Minitab. This would save the Center $500 per year which should be channeled into the purchase of software for the Wang PC. For less than one year's rental costs, the Center can purchase a more powerful and versatile statistics package (TSP, Stat-Pac) for the PC.

If all three cost-containment measures (and the software rental is applied to new software purchase)are effected, then the operating costs of the Center could be reduced by as much as Rs. 30,000 per month, a savings of thirty-five percent of operating expenses. This should be a target that the Center aims for during the course of the medium-term planning period.

It is not wise to try and save funds on paper, supplies, diskettes, ribbons and other consumables. These items must be procured if the Information Center is to offer a credible service. It is also unwise to try and save money by reducing the amount of local staff training. With the rapid developments in computer technology, continuous training is required.

D. Revenue Generation Options

There is a relatively limited revenue-generation potential in the Information Center. What is most important is that the Center establish clear guidelines and criteria for the fees to be levied. A certain amount of flexibility will also have to be built into the financing system because of the statuatory need to charge different types of users differently. A combination of commercially-based and 'payment according to ability' rules will have to be used.

For the development indicators data supplied from the Data Bank, only a nominal charge should be levied to non-ARTI users. ARTI members requesting data for Institute research should receive it free-of-charge. A nominal charge of Rs.5 per page of computer print-out is the present rate. This covers the cost of computer paper plus about half the terminal cost time (estimated at 3 minutes per page produced). Only a nominal charge can be levied because of the tradition of providing secondary data free (or near-free) of charge in Sri Lanka and the obvious complications associated with selling data provided free to ARTI by collecting agencies.

Processing of data from the Data Archives should be costed at near-commercial rates for data processing. A charge of Rs.200 per hour of programmer/processing time has been established as an initial rate. This will cover the operating costs of the Center, but, unless labor efficiency is increased, will be a fairly expensive means of data processing. All ARTI researchers who wish to use this data and have project financing to support them, should assume this cost. All outside researchers who have project or programme finance to cover their data processing costs (eg. Finance Ministry, Central Bank, AID Agencies) should also be assessed this charge. For those researchers that do not have adequate financing, both within and outside ARTI, a case-by-case decision will have to be made on subsidizing the access charge. The Director of the Institute should make all such decisions of this kind.

Survey processing for outside agencies should be done on a commercial charge basis. An initial charge level of Rs.200 per hour has been used for some of the early jobs, and this is roughly in line with the data processing charges of other installations. It is important that the survey-processing charges levied remain competitive with other installations.

Word-processing and statistical analysis facilities should be offered free-of-charge to ARTI researchers for Institute work. In the medium-term future it appears that the Institute generated word-processing load on the VS-25 will preclude accepting outside jobs. Outside statistical analysis jobs should be charged at the same basis as a data processing job.

Institute researchers using the Wang-PC micro-computer for survey analysis, word processing or other applications should be charged only a very nominal fee to cover the cost of consumables. It is estimated that the consumables costs on the PC will, under moderate usage, amount to Rs.60 per day. During the first year the Wang-PC is introduced, staff use should be subsidized in order to encourage user-experimentation. Hence, a nominal charge of Rs.20 per day should be levied to those researchers who have project financing, and no charge should be levied to those researchers without project-financing. Because it is expected that the demand on the PC will be heavy, no non-ARTI work should be scheduled for this machine.

E. Medium-Term Cost-Revenue Stream Projections

In the medium-term future, it is estimated that total revenues from the Center's operations can rise to cover approximately 9 percent of the total operating costs. This can be achieved through a reduction in operating costs and through an increase in the number of users and the capture rate in billing for Institute jobs. While 9 percent may appear to be a low cost-coverage rate, this is still more than a three-fold improvement over the present level.

The assumptions that are used in the projection of costs and revenues are as follows:

1. labor costs increase by 6% per annum and non-labor costs increase by 8%.
2. depreciation cost drops to zero by 1987 because of replacement financing (at no cost to the Institute)
3. labor costs drop by 9,000 in 1986 because of staff retrenchment, but training charges rise by 3,000 to cover Wang/DMS costs and external Univ. degrees.
4. maintenance charges reduced by 40% from 1987 on due to renegotiation of the service contract.
5. supplies charges rise by 20% because of the need to procure supplies for the micro-computer.
6. software cost drops by $500 in 1986 because of the cancellation of the Minitab rental, but rises to $500 in 1987 to finance micro-computer software purchase.
7. number of pages of data requested from the data bank rises to 200 per month in 1986 and 300 per month thereafter.
8. An average of 20 hours of fully-financed survey processing is done each month.
9. An average of 5 hours of fully-financed word processing is completed each month.
10. An average of 10 hours of fully-financed statistical applications plus micro-computer use is completed monthly.

An annual revenue and cost stream, in nominal terms, is presented in table 7.2 below:

Table 7.2: Projected Annual Cost and Revenue Projections
(Rs. current-prices)

	1985	1986	1987	1988	1989
COSTS					
Depreciation	135000	145800	0	0	0
Air-con./Elec.	54000	58320	62986	68024	73466
Supplies	32400	38880	46656	55987	67185
Software	13500	0	13500	13500	13500
Labor	507000	528420	560665	594845	631076
Maintenance	235920	254794	173260	187120	202090
Training	15000	36000	36000	36000	36000
Data Bank Supplies	6000	6480	6998	7558	8163
Data Bank Transport	6000	6480	6998	7558	8163
Publication Costs	30000	32400	34992	37791	40815
TOTAL COSTS	1034820	1107574	942055	1008385	1080458

---table 7.2 contd.

REVENUE					
Devt Indicators	1464	12000	18000	18000	18000
Survey Proc.	16800	48000	51840	55987	60466
Word Proc.	6000	12000	12960	13997	15117
Micro-Comp.	1200	2400	2592	2799	3023
TOTAL REVENUE	25464	74400	85392	90783	96606
REVENUE AS A PERCENT OF TOTAL COSTS	2	7	9	9	9

F. Fiscal Targets and Implementation Time-Frame

A series of fiscal targets can be set, based on the revenue-cost stream projections listed above. These are as follows:

1. A reduction of operating costs by 30 percent in real 1985 terms, through selected cost-containment measures.
2. An increase in staff productivity by ten percent per annum as measured in (a)surveys processed in the computer center, (b)average WP pages/hour, (c)Pages of Data Provided/Cost of the Data Devt Unit, and (d)Number of Customers/Cost of the Data Devt Unit.

A time-frame for completion of the activities required to achieve such targets is as follows:

Activity	Year				
	1985	1986	1987	1988	1989
1. Cost/Productivity Review	X	X	X	X	X
2. Cost-Containment					
(a)labor	X	X			
(b)minitab rental	X				
(c)maint. agreement	X	X			
(d)replacement fund financing		X	X	X	
3. Revenue Generation					
(a)annual review	X	X	X	X	X
(b)charge-comparisons with private firms	X	X	X	X	X

Chapter IIX: Management Improvement

A. Structure and Responsibility

The structure and organization of the Information Center reflects a great deal of careful thought and planning. There is a relatively good balance between junior, middle and senior level staff and the lines of authority have been clearly drawn. The Center is small enough so that problems are identified quickly and management is kept well informed. Overall, there is a sound delegation of authority and responsibility and the attitude of the staff towards the work is sound and positive.

Although the Computer Center and the Data Development Unit are classified as seperate entities, they share a common office space and work closely together. Since the Computer Center is relatively new, all of the staff, with the exception of the data processing manager, are occupying their first computer-related posts. The responsibilities of the officers have been defined through a mixture of management direction and practical adaption to changing needs and circumstances. For example, the data entry assistants spend the bulk of their time entering data, but they also assist in coding, system backups and other related chores.

As a reflection of the relative newness of the Information Center, no formal scope of work, or set of responsibilities has been developed for any of the officers. While this may be viable in the initial experimental stages of the Center's development, it is counter-productive in the medium-term future. Staff replacements will likely be required and unless the nature of work responsibilities are to change with each change in staffing, some system of assigning general and specific work responsibilties must be developed. As a start, a list of duties and responsibilities for the Data Processing Manager, Programmers/Analysts, and Data Development officers should be prepared. Since these posts are already filled, it would be appropriate to involve the staff in defining a list of duties and responsibilities. Preparation of such a list would facilitate replacement decisions and would also provide a yardstick against which staff performance can be measured.

B. Developing a Systems Orientation

There is a noticable lack of a system's orientation to job execution in both the computer center and the data development unit. By this is meant that there is not a set of standard planning and operating procedures which are used in the design and implementation of each and every job. Bits and pieces of systems procedures are used by the Center staff, and there is a general awareness of systems analysis procedures.

There are several reasons for this. First is the mistaken impression, reinforced in local training institutes, that systems-analysis and especially systems design is

unnecessary for a research center and is only useful for a private business establishment. Another reason why systems analysis techniques are not used is because of the desire on the part of the staff to proceed immediatly with system implementation. For the computer center staff, this implies a rush to immediately write and test the programs. For the Data Development Unit, this implies a rush to collect and code the data before the rules for structuring the collection system have been defined. A third factor responsible for the neglect of systems analysis procedures is simply a lack of skills and training in this area. The skills and ability required for a systems analysis job are often quite different from those possessed by a programmer or a statistical officer and require an ample time to develop. Also, it is the case that system's analysis work will require a great deal of sustained, direct interaction between the Information Center staff, Data Bank users and the ARTI research staff. Differences in job-level and status appear to make such interaction difficult.

One way of encouraging a greater systems orientation is to require the completion of a system-dossier for each major job. Such a dossier should, at a minimum, include:

1. a feasability study
2. an initial fact-finding report
3. an initial system design
4. a set of input/output specifications and procedures
5. a database, file and coding specifications
6. finalized system design
7. program specification
8. testing/handover procedures
9. training plan and materials
10. system maintenance schedule

The computer center staff have had sufficient formal training in systems analysis procedures. What is needed is more practical experience in applying these tools to Institute problems. For two major jobs, in particular, it is essential that a proper systems design is conducted. These two jobs are the computerization of the development indicators data base and the computerization of the market research unit survey data.

Another way of encouraging the adoption of improved systems analysis procedures is by periodically using an external auditor to evaluate live systems. Such an auditor must be a computer professional with considerable experience in systems analysis. For major jobs, it is useful to use an outside auditor to evaluate either the entire design or specific components. The software manager at DMS/Wang has agreed to provide such external auditing services, at no charge, for the Data Bank system. This offer should be accepted and active use made of an external performance audit.

C. Improving Documentation

Proper documentation is required in order to efficiently run an Information Center. Without proper documentation, data will invariably be lost, programs will require continuous repair, and the day-to-day management control of the Center will be lost. In computer installations, it is possible for programmers to take a rather proprietary attitude towards their work. The lack of proper system documentation reinforces this proprietary attitude and leads to a situation in which systems/programmes/files etc. can only be used, or repaired, by a particular programmer. Should that individual leave the Center, or be absent for an extended period of time, the job must then be started afresh.

Proper documentation requires careful staff supervision and continuous management input. It does not occur spontaneously. Documentation is often viewed as merely a clerical burden by the staff. Documentation must be continiously scrutinized for comprehensiveness, accuracy and timely completion.

Logbooks must be kept for terminal-time usage. These logs should be summarized on a monthly basis to calculate the time-required for different jobs. An inventory must be kept of manuals and of supplies. The supplies inventory should be updated monthly and a three-months supply of consumables kept in stock. A sign-up schedule should also be maintained to be used to allocate computer time. This can then be compared with the monthly log-book to identify inconsistencies between the use of reserved time-slots and the actual use of terminal time. It is also necessary to maintain a library of diskette files, to ensure that off-line data is properly stored, that a safe number of back-ups are available and that spurious information is not stored.

A repair register should be maintained for any computer breakdown. Hardware and software problems should be noted in the register and this will be used by the Wang representatives in their repair operations. Many of the queries or requests to DMS-Wang (as service contractors) are transmitted verbally. A log should be maintained of requests made to the service contractors and the action taken. Without that, it is impossible to track the performance of the service contractor. Except for the last item, all of the other registers and schedules are now being used in the Information Center. There is a lack of accuracy in these records, which suggests that they have not been closely scrutinized. It is this element, the supervision and scrutiny of the existing documentation system, that requires the greatest improvement.

The data collection side of the Data Bank has developed at a far faster pace than the documentation. As a result, the Data Development Unit is already experiencing a certain amount of information overload. In order to computerize the data bank, it is necessary that the information that is, or will be, part of

the collection be properly documented and more importantly, that a data collection and data entry schedule be maintained. In the first instance, this will require a catalog of data available with the Unit. Such a catalog must be highly disaggregated and should be updated continuously. A start was made at developing such a catalogue in July of 1985. In addition, a data collection schedule should be developed in order to harmonize data-entry and collection activities. Future plans to increase researcher access to the computer will limit the amount of time available for Data Bank data entry. This will likely mean that the Data Bank must carefully schedule it's collection and entry activities.

D. Improving System Security

In the early stages of Information Center development, relatively little attention was devoted to data security or to system security. Fortunately, there has not been any serious breach of security and the situation can be rectified relatively easily. The integrity of the data and the Center can be improved at a nominal cost.

It is important for the Center staff to try and identify high-risk situations, alternative means of minimizing those risks and the costs attached to prevention and recovery mechanisms. Certain risks cannot be avoided, and only those with a high-cost should be contained. The Center must take into account the risks associated with theft, physical damage, file/data tampering, power loss and accidental corruption and damage of files, records and other materials.

Some simple measures can be undertaken in order to reduce the risk level. Three generations of master file back-ups should be taken. Two diskette generations should be maintained at the computer center and a third should be maintained, in a relatively cool and dry location, in another wing of the Institute. Such diskettes should be stored under lock and key. Because a diskette is not a particularly good long-term storage media, periodic integrity-checks on the back-ups must be conducted.

All survey processing files and forms should be kept in a locked cabinet when not in use. A sign-out sheet should be maintained for these materials. When a survey analysis job is completed, the forms should be promptly returned to the research officer. Under no condition should survey forms, coding sheets and system-documentation files be left open or in an uncontrolled environment.

The Data Bank development indicators files should be maintained in a locked cabinet. A sign-out sheet should be used for file removal and a periodic inventory should be taken of these files. After the files has been computerized, the recording and code sheets should be removed to the storage room.

A clean and neat work environment, particularly in the computer room, is a sign that the staff is conscious of the need to maintain facility security. The higher the degree of staff consciousness, the lower the probability that breaches of security will go unreported. Superfluous papers and other materials should not be kept on the desks. All materials should be removed from the desks overnight; the printers and work stations kept free of litter and the cabinets and bookshelves secured. The data processing manager should be responsible for the security and the physical appearance of the computer facilities. Likewise, the data bank manager should be responsible for the security and physical appearance of the Data Development Unit. Both officers should be authorized to correct breaches of security.

E. Staff Incentives

It is common for computer installations in Sri Lanka to work on either a piece-rate basis or an incentive-payment system. This is particularly the case for data-entry operators, but also extends to word-processing operators, programmers, systems analysts and so forth. For the private sector data-processing installations, bonus-systems and piece-rates are cited as being an invaluable tool in the management kit to raise staff productivity, improve attendence and increase overall operating efficiency. In some of the larger public-sector computer installations, incentive payments are also used to increase operating efficiency. Hence, the precedent has clearly been set in other public sector installations for instituting an incentives system.

The rationale for instituting an incentives scheme in the ARTI computer center is that such schemes are operating elsewhere and that there is a wide productivity gap between the ARTI computer installation and the private installations. The magnitude of this productivity gap can be approximated from a comparison of figures based on interviews with two private computer firms and with ARTI staff:

	ARTI Productivity	Private Productivity
Word Processing (draft pages/hour)	4 to 6	12 to 15
Date Entry (depressions/hour)	4,000 to 6,000	9,000 to 13,000

It is difficult to assess the comparitive efficiency of ARTI versus private programmers, because the nature of the jobs are rather different.

Although there is evidence of a productivity gap, there is no conclusive evidence to suggest that this is due to a lack

of incentives. The salaries and pecuniary benefits the staff earns are considerably less than what the private sector is paying. However, the increased job security and lower-pressured work environment seem to be satisfactory inducements for public sector employment.

An alternative explanation for the productivity gap may be that the staff is still learning to use the equipment and that this situation will begin to correct itself when the staff gains further experience. There is some truth to this latter explanation, although it cannot fully explain such a wide gap.

Before an incentives scheme is introduced, it is worth asking if such a scheme is necessary and if it would be financially viable. During the first eighteen months of the Center's operation, the computer has been used during one shift only and at less than full capacity. There have also been few jobs submitted to the Center with strict completion deadlines where job payment is tied to a particular processing timeframe.

In the future, it is not clear that the survey processing jobs likely to be submitted by the ARTI staff would require completion by a strict time-deadline. In that case, it is unlikely that the research staff would gain enough from the more rapid job completion rate to cover the costs of an incentives payment. The only job which is likely to have a strict time-requirement is the processing of the market survey data produced by the Market Research Unit. Since this is a non-revenue generating activity of the Institute, it is difficult to see how incentive payments can be paid for rapid data entry or processing.

There are other factors which argue against the provision of incentives payments for the computer center staff. These are as follows:

a. the bulk of the data entry time is taken up for entering the Data Bank development indicators. This is an Information Center job and it would be unwise, and financially difficult, to pay a bonus for performing the Center's own work.

b. There is still ample slack-time in the computer center and it is unwise to provide an incentives payment without a sufficient workload to keep the staff fully occupied.

For the reason's cited above, it is not deemed advisable to institute an incentives payment system at the present time. If, however, the demand for the Center's resources increases, and in particular, there is an increased demand for rapid-turnover activities, then an incentives scheme should be initiated. It is unlikely that this will occur within the next calender year, but should be carefully assessed thereafter.

If, on the basis of an assessment of Center productivity and demand, it is decided that a monetary incentives system is to be used, then this should be enacted on the basis of a group-based bonus system. In such a system, a data processing group, comprised of a systems analyst, programmer and data entry operator would be assigned the responsibility for completing a particular job by a particular date. If the job is then completed on or ahead of schedule to the satisfaction of the customer, then the team would receive a percentage of the processing fee. This should be used primarily for outside-ARTI processing jobs and the percentage-bonus, team composition and processing deadline should be approved, for each case, by the deputy-director of the Information Center.

In a situation in which the work load is not enough to justify the use of an bonus-payment or a cash-based incentives scheme, the provision of training opportunities should serve as a strong incentive for improved labor productivity. During the past year, two programmers, two data analysts and the deputy director have been sent overseas for short-term training. Staff have also been trained, in short-courses, at the National Institute of Business Management and at the local Wang installation. It should be made clear to the staff that opportunities do exist within ARTI to provide for skill-upgrading but that these opportunities must be earned, and are the result of a sound work performance. If training opportunities are wasted, or misutilized then the Center loses both the immediate investment plus the long-term use of training as an incentive for improving productivity.

F. The Physical Work Environment

The nature of the physical work environment will have a major impact on staff performance and on the overall productivity of the Information Center. At present, the computer center is badly over-crowded, with ten to twelve staff members occupying one main computer room. The traffic through the room is great and there is rarely enough peace and quiet for program development. The room housing the data development unit is similarly over-crowded and storage space is seriously lacking.

There is little prospect for re-arranging staff and facilities within the two rooms to gain space or improve the work atmosphere. If the existing staff size is maintained, then it is essential that suitable work space be provided. It is suggested that two additional rooms be provided for the Information Center staff. One room should be used as an office for the deputy-director and the other should be used as a conference/training/meeting room for the computer center staff.

G. Management Targets and Timeframe

The provision of management targets will help to focus attention on certain key areas. The following are targets for activities which are in addition to normal management responsibilities:

1. Development of a general terms of reference for senior staff by end 1986.
2. Complete systems dossier available for the development indicators and the market research unit computerization.
3. All logbooks completed and accurate (annual target).
4. Supplies inventory kept up-to-date and no shortage of consumables experienced (annual target).
5. Improved work facilities provided (end 1987 target).

A timeframe for the implementation of the activities cited in this chapter is as follows:

Activity	Year				
	1985	1986	1987	1988	1989
1. Staff TOR's Prepared		X			
2. System Dossiers					
a. Data Bank job	X				
b. Market Research job	X				
3. Documentation					
a. logbooks prepared and updated	X	X	X	X	X
b. program documentation prepared and reviewed		X	X	X	X
c. Data Bank catalog prepared and updated	X	X	X	X	X
4. System Security					
a. seperate backup storage space identified		X			
b. data bank files stored in locked cabinet	X				
5. Assessment of the Need for a staff incentives scheme			X		
6. Identification of Additional Work Space		X			

Chapter IX. Ongoing Planning Activities

A. The Role of Short and Long-Term Planning Activities

A Plan is, at best, a guide to action. Neither the plan nor the planning exercise has any value unless it is implemented. The Medium-Term Plan should not be used as a rigid implementation blueprint, but rather as a guide for ordering priorities and structuring the short-term workload.

Short-term plans are needed to direct Center resources into different activities during a calender year period. Short-term planning activities can be used as a way of introducing flexibility into a planned work horizen. Such plans should be developed on an as-needed basis, but no less frequently than once a year. Such short-term plans should be developed by the deputy-director of the Information Center. Again, the greater the degree of staff participation in the setting of short-term goals and work programs, the greater the likelyhood that such programs will be successfully implemented.

Long-term plans serve as a means of periodically re-thinking the goals and objectives of an institution and charting an effective course towards those new or revised ends. For the Information Center, a formal long-term planning effort would serve little purpose since the long-term goals and objectives of the Center must be subordinate to the long-term goals and objectives of ARTI as a whole. This does not means, however, that there is no place for long-term planning within the Information Center. Certain activities that fall squarely within the domain of the Information Center will require more than a five year period to accomplish. These activities should not be neglected simply because they have a long gestation period. Long-term planning efforts can also be used as a way of periodically assessing the appropriateness of the basic goals and objectives of the Center and then reconciling those with the goals and objectives of the Institute as a whole. This will certainly be important if there are fundemental changes in the Institute.

B. Long-Term Assessment Requirements

Long-term planning, or assessment, will be required in order to evaluate and re-design the basic development strategy of the Center. As stated in Chapter 1, this Plan is based on the premise that the Information Center must establish a strong base of support and involvement within the Institute before branching out to take on sectoral or national responsibilities. Hence the activities that have been suggested are largely geared to firmly cementing the Center's position within the Institute. It may be that this overriding objective is satisfactorily accomplished well in advance of the end of the medium-term Planning period. If so, then it would be wise to consider a

shift in the Center's focus towards provision of services for non-ARTI clientele. However, a careful progress assessment and Center policy review is required before such a shift in priorities is made.

It is useful to have a long-term planning exercise every five years or so in order to evaluate the progress made by the Center and to re-define long-term aims and objectives. More than anything else, this will ensure that the staff will have the opportunity to make the connection between the progress that has been made and the direction that efforts are to take in the future. Unless there is a clear connection between long-term strategic planning and progress evaluation, both the planning process and the evaluation process will lose legitimacy. A long-term strategic plan should not be any more sophisticated than the requirements of the activity demand. For the Information Center, it is suggested that a long-term (5 to 10 year) strategic plan be prepared at the end of 1999. Such a plan should aim to be indicative and clear, rather than comprehensive and dirgistic. The long-term Plan should focus on the following areas:

1. A restatement of past Center goals and objectives,
2. An evaluation of Center performance in achieving set goals and targets,
3. Identification of and rationale for, new or revised goals and objectives.
4. Basic strategy for achieving such goals and objectives.
5. Revised targets and monitoring frame.

C. Short-Term Priority Planning

Routine planning efforts will be needed in the near-term future in order to, for example, assign staff, undertake particular survey processing jobs and so forth. Special short-term planning efforts will be required in order to implement 'new' activities proposed in the Medium-Term Plan. Two areas, in particular, will require a near-term planning effort.

The first area that will require short-term planning is for computer hardware and software expansion. It will be necessary to ensure that the hardware/software being used meets the needs of the Institute and is reasonably cost-efficient. As Chapter II argues, it is becoming increasingly more cost-efficient to convert systems which require a low access rate and a modest amount of storage space to a micro-computer network than to rely on a mini-computer based system. A start in this direction is the proposed procurement of one Wang-PC microcomputer to network with the VS-25 minicomputer. Procedures for evaluating system replacement and modification decisions are described in annexure 2. An annual short-term equipment/software procurement plan should be developed, taking into account the advantages and disadvantages of system replacement. This should also serve as an opportunity to review the supplies inventory and to plan for procurement of supplies and disposables for both the computer center and the data development unit.

The second set of Information Center activities which will require short-term planning is in the area of manpower and training. A brief annual plan should be prepared detailing the estimated manpower requirements of the different Center tasks and the staff available to execute such tasks. At the same time, provisions must be made for Center staff training and training of the Institute staff. Such activities should be planned no less than six months in advance of implementation. Also, contingency plans must be drawn for staff turnover, as this is particularly likely to become a problem-area as the market for computer professionals expands.

A summarized time-frame for the near and long-term planning activities is as follows:

Activity	Year				
	1985	1986	1987	1988	1989
1.Long-term Planning					
(A)Strategy Reformulation			X	X	X
(B)Long-Term Evaluation/ Perspective Plan					X
2.Short-term Planning					
(A)Equipment Plan			X	X	X
(B)Training/Manpower Plan		X	X	X	X

D. Plan Monitoring

The best laid plans come to naught unless careful attention is given to implementation. Some form of monitoring must be used to ensure that steady implementation progress is made towards achieving the pre-defined goals and objectives. The existing monitoring system consists of monthly progress reports which are compiled to produce a quarterly progress report. The use of a monthly progress report is a convenient mechanism for tracking staff activities and should be preserved.

A monitoring device should serve as a means for collecting relevant information upon which administrative decisions can be made. Spurious or non-essential information should not be collected or reported. At present, the monthly progress report is a cursory statement of the activities of the various units of the Center. Practically no mention is made of problems that have occured. No mention at all is made of the progress of the Center in achieving some particular target or objective and there is relatively little discussion of short-term aims or targets. In addition, important Center management decisions are also not documented in these reports.

Since the material presented in the monthly progress report is rather sparse and since the report is rarely discussed

with the staff, most members are hardly aware that any monitoring is taking place, much less that it has an influence over the nature of their future work assignments. Both the Center's staff and management appear to view the completion of the progress report as largely an upward reporting requirement. However, there is a great deal of interest, from all sides, in transforming the monthly progress report into a more useful monitoring instrument.

In order to use the monthly progress report as a monitoring instrument, the information base provided in the reports must be broadened and linked with administrative actions. For the computer center and the data bank, new areas of interest that could be incorporated into the report are as follows:

1. problems encountered in the past month and the means by which such problems were resolved.
2. attempts made to induce new customers to use the Center's facilities.
3. number of customers/clients who used the facilities and for what purpose.

It would also be useful if the reports could include a section on quarterly target completion and short-term goals; however this may be overly ambitious in light of the existing reporting system.

The monthly progress reports should not carry private or sensitive information. The reports should not be seen as a one-sided attempt by the Center's management to document the errors or faults of the staff. It should be made clear that the purpose of the progress report is simply to identify the progress that has been made during the previous time period. Progress must be measured relative to a discrete set of aims and objectives and it is this link--between activities and objectives-- which needs to be injected into the progress reports.

A monitoring system should be used to make administrative decisions,otherwise it is a waste of time and effort. It should be made clear to the Information Center staff that such decisions are being made on the basis of the progress reports. Furthermore, the monthly progress reports should be discussed collectively with the staff, so that the decision-making and the target-setting process are clearly coordinated and understood.

Annexure 1: Agencies Contacted During Plan Preperation*

Agrarian Research and Training Institute
Ministry of Agriculture
Department of Agriculture
Ministry of Lands and Lands Development
Ministry of Fisheries
Ministry of Mahawelli Development
Ministry of Coconut Industries
Ministry of Plantation Industries
Department of Rubber Control
Ministry of Rural Industrial Development
National Planning Division
Regional Planning Division
Food and Nutrition Planning and Policy Division
Department of Agrarian Services
Department of Census and Statistics
The Central Bank
The Bank of Ceylon
University of Colombo
Peradiniya Agriculture University
CISIR
National Institute for Business Management
USAID/Colombo
UNDP/Colombo
IBRD/Colombo
The Netherlands Embassy
Wang/DMS
IBM Worldwide
CBA Inc.
Bartlett Electronic Services
Sathosa Computer Services

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*more than one-hundred and fifty individuals from the agencies cited above were interviewed during the preparation of the Medium-Term Plan. The cooperation and guidance of all those who provided assistance is gratefully acknowledged. Special mention must be made of the ARTI research staff and especially the Information Center staff who openly shared their records, experiences and ideas. The responsibility for all errors and ommissions rests with the consultant.

Annexure 2: Investment Criteria for System Replacement and/or Modification

Computers rapidly become obsolete well before the physical service life of the machinery has ended. Because of rapid technological development and mass production, computer systems can become economically obsolete almost as soon as they are procured. Simply because a piece of equipment is economically obsolete does not mean that it must automatically be discarded. However, when the information processing capability of an organization rests on an old, or outmoded technology, then (varying proportionately to the contribution of information processing capability to total factor productivity) that organization will be at a relative disadvantage to those who adopt the more advanced technology.

A given capital stock is said to be economically obsolete when it is economically more attractive to replace rather than to maintain, repair or rehabilitate the existing system. What is economically more attractive depends on the criteria that is being used to evaluate the investment. A variety of tools can be used to evaluate investments and the choice of technique will differ depending on whether one takes an economic or a financial perspective: whether one views the choice from a social or an individual firm's vantage point. ARTI, as a semi-public Institute, should rely on a set of financial rules for making its investment choice.

Fortunately, investment choices for information processing are not a question of replacement or nothing. Computers have become less and less of a lumpy investment due to advances in networking, multi-user systems, and small modular systems. Consequently, system modification is often equally as viable an alternative as replacement.

Decisions to replace or modify a computer system in Sri Lanka are complicated by the lack of a secondary market for computer equipment. Many government agencies simply do not discontinue the use of old, expensive to operate systems, because there is simply no market to dispose of such systems. In the future it is likely that the second-hand computer market will improve, but that this will be confined to relatively new micro- and mini-computer systems. The probability that a government agency can expect a 'good' trade-in on a computer system is very slim.

ARTI's computer operations will be subsidized by the Government and many of the benefits accruing from the use of the facility will not be captured by the Institute and are difficult to cost-out. The primary investment criteria that the Center should use is to aim to provide a 'cost-efficient' computer service. In other words, for the given amount of work to be done, the Center should aim to complete that work at a minimum cost.

When considering a change in computer configuration, the Center should compare each option on the basis of the present value of the cost-stream of each system. For example, assume that the operating cost of the existing system is 1 million rupees per year and that the capital cost has been fully amortized (or covered through zero cost equity financing--eg. a grant). Assume also that the modified system--system B--has a capital cost of Rs.300,000 and an annual operating cost of Rs.900,000. To switch from system A to B will have a frictional cost of Rs.50,000. If we compare the cost flow of the two systems, we obtain the following:

System	Year 1	2	3	4	5	6	7
	(cost stream--million Rs.) (in constant year 1 prices)						
A	1	1	1	1	1	1	1
B	1.25	.9	.9	.9	.9	.9	.9

In straight financial terms, the second system would have a four year payback period. This can be somewhat misleading because we have assumed that there is no time-cost attached cost to the use of ARTI funds.

We can better compare the present value of both cost streams to identify an appropriate payback period. This takes into account the fact that a rupee spent today is more valuable than a rupee saved one year from now because of the time-cost attached to consumption. The present value of a cost stream is defined as the sum of the costs divided by one plus the interest rate raised to the N (where N is the year)minus one power. With the two cost streams listed above, and a constant rate of interest of 14 percent per annum, the present value of the cost stream would be:

Economic Life (maximum T)

Years (T:post-investment)

	2	3	4	5	6
System A	1.877	2.646	3.322	3.913	4.433
System B	2.039	2.731	3.339	3.872	4.339

Using the present value criteria, we find that system B does'nt payoff (compared to system A) unless it is used for at least five years. In other words, the present value of the cost time-stream of system B is greater than that of system A until the fifth year of operation. If that is considered too long a period to wait for a payoff from the change then it should not be considered.

The present value criteria is normally extended to cases where a stream of costs and benefits are considered

simultaneously. If, for example, the benefits from the new, or modified system far outweigh the benifits from the existing system then it is misleading to consider only the cost side. For ARTI, it will be difficult, but not impossible, to value the benefits from different computer configurations. One way to approach this is to estimate the cost of processing the jobs that are, or will be done, on the ARTI computer at a commercial installation. In other words, estimate the quantity of different types of jobs (word processing, survey processing, data base management, training etc.) and estimate the average cost of each job at an average set of commercial installations. Use this cost-side value to approximate the market-value of the benefits accruing from the use of the computer facility. Estimate future benefit streams by forecastig likely changes in the unit-charges for different types of jobs at the commercial facilities. Once this is done, obtain the net value of the computer system by subtracting the contemporaneous year's costs from its benefits. Then estimate the net present value of the configuration using the same procedure as applied above.

A cost-effectiveness or a net-present value comparison are two commonly used methods to screen an investment. Both can be adapted relatively easily to use in the Information Center. However, other factors should also be considered. These are factors which are difficult to price, but may be no less important than the direct economic comparison. For example, the degree to which the new system is more or less flexible, has access to a wider or more narrow range of software, is more or less likely to require servicing etc. are all factors which should influence a procurement decision. In order to account for these factors, weights should be assigned to the different criteria and points accorded to the possible outcomes. Each system should then be ranked and the totals compared(*). It will be important to ensure that the new configuration is not only more cost efficient, has a higher net present value but also gets a higher rank when these qualitative factors are taken into account. Such ranking procedures are standard practice for government commodity procurement and the Information Center staff has experience in using such techniques.

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*A variety of multi-criteria decision making tools can be used to identify optimum selections when a mixture of qualitative and quantiative performance criteria are in force. For ARTI's purposes, a straight rank comparison of scored alternatives will suffice.

Annexure 3: End of Term Report to the USAID/Colombo

The consultant, Steven R. Tabor, arrived in Colombo on May 30 to assume his duties as information services advisor, provided by the International Science and Technology Institute Inc. under a technical assistance contract number (PIO/T) 383-0044-3-30028.

Mr. Tabor departed Colombo on June 20, 1985, and finalized his report on the 25th of August 1985. Mr. Tabor has discussed the findings from his consultancy and the draft medium-term development plan with the staff of the USAID/Colombo, the ARTI and the ARTI Board of Governors. In addition, the draft Plan has been discussed with Miss. T. Shanmugam, deputy-director of the Information Center, during her visit to the Netherlands between August 12th and August 25th. The draft Plan has been revised in light of the comments and suggestions from the aforementioned officials. Mr. Tabor was provided office facilities, transport and secretarial assistance by the Agriarian Research and Training Institute (ARTI). The staff of the Institute was fully cooperative and supportive of the consultant throughout his stay in Sri Lanka.

The terms of reference of the consultant were as follows:

1. To develop a Strategic Information Management Plan
2. To Provide Tactical, Analytical and Training Support
   (a) identify software for the Wang VS-25 computer
   (b) train ARTI staff in automated research methods
   (c) recommend actions ARTI can take to encourage clients to use the information center.
   (d) help develop procedures to facilitate the statistical analysis of agricultural data.
   (e) train ARTI staff in current methods of agricultural economics analysis.
3. Execute other specific actions:
   (a) provide information on short-term training institutions.
   (b) examine the existing information system and guide expansion or revision of such systems.
   (c) work with an information systems specialist to prepare a specific plan for upgrading the computer system.

Duing the period of the consultancy the following activities were undertaken, either individually by the consultant or jointly by the consultant together with the staff of the Information Center, ARTI:

(1) spreadsheet and statistical software for the Wang VS-25 were identified and a note presented to the DD-Information Center on the cost and availability of such software.
(2) an assessment was made of near-term computer hardware and software needs and bids were solicited for systems from three local computer vendors.
(3) selection criteria for the computer bids was devised;

the bids were evaluated and a request for procurement of a micro-computer was presented for financing under the AID Information Center project.

(4) short-term overseas training courses were identified for the Deputy Director of the Information Center, two programmers and two data development/statistics officers. A schedule of visits was prepared for each trainee and a request for training was submitted to USAID. All of the above officers were sent for their short-term training and visits as financed under the USAID Information Center project.

(5) A medium-term Information Center Plan was prepared. This included an assessment of the Center's goals and objectives, hardware and software needs, manpower and training needs, the use of the Data Bank, services required within the ARTI, management improvement strategies, cost control and revenue generation options and future planning requirements. To gather background material for the plan, interviews were conducted with representatives of various Agricultural Ministries, Departments, Universities, Banks and Agencies.

(6) A three week training course in Systems Analysis techniques was held for the computer center and the data development unit staff. The Agricultural Data Bank was re-designed as a part of the classwork.

(7) A two day seminar on an 'Introduction to Computer Science' and to processing survey data on the Wang VS-25 was held for the research staff of the Institute. This was followed by a week of intensive one-on-one hands-on computer training of the research staff on the use of the data entry and report utilities.

(8) A two day seminar on 'Statistical Analysis' on the Wang VS-25 was held for selected members of the ARTI research staff. This included an introduction to the use of Minitab on the Wang VS-25.

(9) A seminar on "non-traditional techniques for agricultural price policy analysis" was delivered to the ARTI staff and to invited participants.

(10) A seminar was held for the national library association on strategies for computerizing small-scale data bases.

(11) A set of improved procedures for managing the computer center was adopted. This included measures to improve computer and data security; scheduling, back-up, documentation and training procedures.

(12) The National Agriculture Data Bank was redesigned according to criteria agreed upon during the initial phases of the consultancy. A systems design of the automation of the market research unit's weekly price collection system was initiated.